United Nations A/70/723

General Assembly

Distr.: General
9 February 2016

Original: English

Seventieth session
Agenda item 125
Global health and foreign policy

Protecting humanity from future health crises

Report of the High-level Panel on the Global Response to Health Crises

16-01747 (E) 040316

Please recycle

Contents

		Page
	Abbreviations	4
	Preface	5
	Summary	7
	Recommendations	12
I.	Introduction	23
	A. The 2014 Ebola outbreak in West Africa — a preventable tragedy	24
	B. The global burden of communicable diseases	27
	C. The broader socioeconomic impact of health crises	29
	D. Communicable diseases — diseases of poverty	31
	E. A world unprepared	32
II.	National level	33
	A. Implementing the International Health Regulations core capacities and strengthening health systems	34
	B. Building an effective health workforce	39
	C. Addressing governance challenges	40
	D. Strengthening community engagement	41
	E. Training the military for health and humanitarian missions	43
	F. Ensuring the continuation of essential health services	43
	G. Addressing the gender aspects of health crises	44
III.	Regional and subregional levels	45
IV.	International level	47
	A. Strengthening the World Health Organization periodic review mechanism for compliance with the International Health Regulations core capacities	47
	B. Strengthening the operational capacities of the World Health Organization	49
	C. Enhancing United Nations system-wide coordination in the global response to health crises	55
V.	Cross-cutting issues	58
	A. Development and health	58
	B. Research and development	62
	C. Finance and economic measures	67
VI.	Follow-up and implementation	73

Annexes

I. Glossary 76
II. Key dates for the crisis and response 83
III. Composition of the Panel 86
IV. Meetings conducted 88
V. Research commissioned 90
VI. Condensed bibliography 91
VII. Acknowledgements 96

Abbreviations

ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
GAVI	Global Alliance for Vaccines and Immunization
GDP	gross domestic product
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GNI	gross national income
IASC	Inter-Agency Standing Committee
IHR	International Health Regulations
MERS	Middle East respiratory syndrome
NGO	non-governmental organization
ODA	official development assistance
PHEIC	public health emergency of international concern
PIP Framework	Pandemic Influenza Preparedness Framework
SARS	severe acute respiratory syndrome
TRIPS Agreement	World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNMEER	United Nations Mission for Ebola Emergency Response
WASH	Water, Sanitation and Hygiene for All
WHO	World Health Organization
WFP	World Food Programme
WTO	World Trade Organization

Preface

When 2-year-old Emile Ouamouno from Guinea contracted Ebola and died on 28 December 2013, little did anyone realize that it would set off a chain of events that would lead to the deaths of more than 11,000 people, create worldwide fear, and require the mobilization of a multibillion dollar global response.

The outbreak of Ebola in West Africa was only one of several epidemics experienced so far in the twenty-first century. These include the four major outbreaks of Middle East respiratory syndrome (MERS) in Saudi Arabia and the Republic of Korea, the pandemics of H1N1 and H5N1 influenza, and severe acute respiratory syndrome (SARS). These all serve as a stark reminder of the threat to humanity posed by emerging communicable diseases.

In this context, the United Nations Secretary-General established the High-level Panel on the Global Response to Health Crises in April 2015 to propose recommendations that would strengthen national and international systems to prevent and respond effectively to future health crises, taking into account lessons learned from the Ebola response.

The Panel focused its attention on health crises arising from the outbreaks of new, acute or re-emerging communicable diseases that pose a threat of international spread. The Panel saw its task as being forward-looking in proposing critical measures that would better prevent and respond to future health crises. The report should not be considered as a critique of the Ebola response, as other reviews were more technically qualified to address this. Nevertheless, the Panel examined such reviews in-depth and used the global response to the Ebola outbreak as a point of departure for its deliberations.

Following its extensive consultations, the Panel notes that the high risk of major health crises is widely underestimated, and that the world's preparedness and capacity to respond is woefully insufficient. Future epidemics could far exceed the scale and devastation of the West Africa Ebola outbreak. The Panel was very concerned to learn that the emergence of a highly pathogenic influenza virus, which could rapidly result in millions of deaths and cause major social, economic and political disruption, is not an unlikely scenario.

The Panel therefore recommends a series of measures to strengthen the global health architecture to better address the threat of pandemics.

The Panel is convinced that there is no substitute for having a single global health leader with significant resources to determine and execute global health priorities. The World Health Organization (WHO) should become this leader. The Panel notes that to date, the emergency response capabilities of WHO have been lacking, and attempts at reforming the organization have been largely unsuccessful. While much responsibility for implementing reforms belongs to the WHO secretariat, WHO member States have provided very weak support to WHO. In 2011, in a report to the World Health Assembly on the future of financing for WHO, the organization's Director-General stated that "WHO finds itself overcommitted, overextended, and in need of specific reforms. Priority-setting is neither sufficiently selective nor strategically focused". If WHO does not successfully reform, the next major pandemic will cause thousands of otherwise preventable deaths. This may be the last opportunity to ensure that WHO is empowered to build an effective

emergency preparedness and response capacity with the necessary political leadership. Another failure to perform may necessitate the consideration of alternate United Nations institutional response mechanisms.

Too often, global panic about epidemics has been followed by complacency and inaction. For example, the 2009 influenza pandemic prompted a similar review of global preparedness, but most of its recommendations were not addressed. Had they been implemented, thousands of lives could have been saved in West Africa.

We owe it to the victims to prevent a recurrence of this tragedy. This will require sustained political follow-up to build a robust architecture for health crisis response. The Panel therefore proposes the creation of a high-level council on global public health crises and the organization of a summit on global public health crises to maintain the momentum and monitor progress in the implementation of the reforms needed.

The Panel is grateful to the Secretary-General for his foresight in seeking to prepare the world for health crises, and hopes that the recommendations contained in the report will help to prevent the loss of many lives in the future.

(*Signed*) Jakaya Mrisho **Kikwete**
United Republic of Tanzania
Chair

Summary

The Ebola outbreak as a wake-up call

The 2014 Ebola outbreak was a human tragedy that took thousands of lives, caused tremendous suffering, and left deep wounds in communities in Guinea, Sierra Leone and Liberia. And yet, it was preventable. Much more could have been done to halt its spread earlier. The crisis must serve as a wake-up call for increased global action to prevent future health crises.

The multiple failures experienced during the Ebola response demonstrated that the world remains ill-prepared to address the threat posed by epidemics. A lack of basic surveillance capacities in West Africa meant that the virus initially spread undetected for three months. When recognized, the scale of the outbreak was underestimated by experts and minimized by authorities. Despite numerous warnings from groups including Médecins sans frontières, the Governments of the three most-affected countries and the World Health Organization (WHO) maintained that the outbreak would soon be under control. It was not until 1,600 people had been infected and the epidemic was spiralling out of control that WHO declared the Ebola outbreak to be a public health emergency of international concern (PHEIC), thereby attracting the world's attention.

When the epidemic was recognized as a global threat, the world mobilized unprecedented resources and capacities, which included the deployment of foreign military assets and the decision by the Secretary-General to establish the first-ever United Nations health emergency mission. Nevertheless, the response was hampered by a lack of trained and experienced personnel willing to deploy to the affected countries, inadequate financial resources, a limited understanding of effective response methods, ineffective community engagement and poor coordination. As a result of these delays and failures, thousands of lives were lost.

More than two years after the first death from the epidemic, 11,316 people have been killed by the disease, and 28,638 infections have been reported.* The epidemic also caused an estimated US$ 2.2 billion in economic losses in the most affected-countries, reversing hard-won progress towards the Millennium Development Goals.

The global burden of communicable diseases

For centuries, the world has been subjected to epidemics and outbreaks with often devastating consequences. In 1918, a pandemic of H1N1 influenza killed an estimated 50 million people. Today, a number of other communicable diseases continue to claim millions of lives. Recent outbreaks of influenza (H1N1 and H5N1), severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) have shown that even sophisticated health systems in developed countries can be challenged by the appearance of new or emergent pathogens.

* Data as at 17 January 2016. Accessed on 22 January 2016 at www.who.int/csr/disease/ebola/en/.

Notwithstanding its devastating impact in West Africa, the Ebola virus is not the most virulent pathogen known to humanity. Mathematical modelling by the Bill and Melinda Gates Foundation has shown that a virulent strain of an airborne influenza virus could spread to all major global capitals within 60 days and kill more than 33 million people within 250 days.

Despite the significant threat, global efforts to prepare for epidemics have been woefully insufficient. The global legal instrument negotiated to ensure early warning and pandemic response, the International Health Regulations (2005) (IHR), has only been fully implemented by one third of its 196 States parties. Similarly, only a small fraction of global investment in research and development for vaccines, therapeutics and diagnostics is devoted to the emerging communicable diseases that primarily affect the developing world.

A call for action

Future pandemic threats will emerge and have potentially devastating consequences. We can either take immediate action to ensure that future threats are contained and humanity is protected, or we will remain vulnerable to losing millions of lives and suffering devastating social, political and economic consequences.

The Panel has made 27 recommendations for action at the national, regional and international levels, including many measures that cut across governance levels and require engagement with all sectors of society. While complex, there are a few concrete actions that can be taken immediately that will involve partners from governments, international institutions, civil society, and the private sector all working together with a newfound urgency. These priority actions will begin to build the global capacity required to manage future health crises and accelerate the implementation of the Panel's recommendations.

First, WHO must build a new centre for emergency preparedness and response and ensure that the world has a standing capacity to immediately identify and respond to emerging communicable disease threats. The centre must have real command and control capability, access to specialized human and operational resources to execute a health response, and the ability to visualize and share validated surveillance data in real time. The centre should benefit from the best technology available to ensure the global community can identify, track and respond effectively to any emerging threat.

Secondly, all countries must meet the full obligations of IHR. Where capacities are lacking, support should be provided to urgently implement a core set of measures. These measures should be under the direct authority of the Heads of Government and should include the establishment of pandemic preparedness and response mechanisms, with clear command and control; hiring and training health professionals and community health workers; and building a comprehensive surveillance system with a national laboratory.

Thirdly, appropriate financing is required. Assistance should be provided to countries requiring additional support for compliance with IHR, while WHO and the new centre for emergency preparedness and response must be resourced to meet global needs. In addition, a fund should be established to support research and development for vaccines, therapeutics and diagnostics for neglected communicable diseases.

To ensure that key measures are taken, a central recommendation of the Panel's work is to establish a high-level council on global public health crises within the General Assembly to provide political leadership on global preparedness, monitor the implementation of reforms and help to prepare for a summit on global public health crises, to be held in 2018.

The Ebola outbreak was a wake-up call. Global leaders must act now to implement the recommendations contained in the report.

Sections of the report

National level (recommendations 1 to 4)

The local community is on the front line of any outbreak, and the State is the primary actor responsible and accountable for issuing appropriate alerts and responding to a crisis. The local and national levels of the global health architecture require the development of foundational capabilities for effective preparedness and response.

The Ebola response demonstrated that the inadequate implementation of national obligations under IHR, weak health systems, governance challenges and poor engagement with communities hampered the ability of national authorities to stem the spread of the virus.

The following key measures are needed at the national level: implement the IHR core capacities; build an effective health workforce; address governance challenges; improve community engagement; and address the gender aspects of health crises.

Regional and subregional level (recommendation 5)

While regional and subregional organizations supported the Ebola crisis response with innovative and experienced capacities, a lack of preparedness and pre-existing arrangements contributed to response delays and coordination challenges.

Regional organizations should develop or strengthen standing capacities to assist in the prevention of and response to health crises, with a particular emphasis on areas where they can add significant value to national responses.

International level (recommendations 6 to 9)

The Ebola crisis also highlighted critical gaps in the international system for responding to health crises. In particular, the mechanism for monitoring compliance with the IHR core capacity requirements is weak. The lack of independent assessments affects international efforts to support more vulnerable countries in implementing preparedness, surveillance, detection and response capacities. In addition, the absence of a strong WHO response capacity and the lack of clarity over the inter-agency leadership and coordination arrangements for health crises delayed an effective response. This delay led the Secretary-General to take the unprecedented decision to establish the first United Nations health emergency mission.

Urgent measures are needed to address these gaps and enhance global capacity to rapidly detect and respond to health crises. These include establishing a stronger periodic review of compliance with the IHR core capacity requirements, strengthening the WHO operational capacities, and enhancing the Inter-Agency Standing Committee coordination mechanisms to better respond to health crises.

Cross-cutting issues (recommendations 10 to 25)

Development and health

While new and dangerous pathogens can emerge in any country in the world, poor living conditions mean that developing countries are particularly vulnerable to the impact of communicable disease outbreaks. Inadequate sanitation can accelerate disease spread, and weak health systems undermine the capacities to respond.

The Panel urges all Member States to achieve the Sustainable Development Goals, particularly in the area of health. It notes that the threat of health crises from communicable diseases has been recognized in Goal 3.3 and urges Member States to ensure that the monitoring and follow-up process of the Goals takes into account compliance with IHR core capacity requirements as a crucial element in preventing outbreaks of communicable diseases. The Panel further recommends that WHO work closely with development actors to ensure complementarity between development programmes and efforts to build health-care systems and public health.

Research and development

The availability of effective medical countermeasures, including vaccines, therapeutics and diagnostics, is crucial in preventing and responding to communicable disease outbreaks. However, investment in medical research and development for diseases that largely affect the poor is deeply inadequate. Of the $214 billion invested in health research and development globally in 2010, less than 2 per cent was allocated to neglected diseases. Even where vaccines or therapeutics exist, they are often inaccessible or unaffordable to vulnerable populations.

Public policy intervention, including more public funding, is required to ensure that greater resources are focused on research and development for neglected diseases and other dangerous pathogens, particularly in developing countries. The Panel therefore recommends that WHO oversee the establishment of a fund to support research and development of vaccines, therapeutics and diagnostics for neglected communicable diseases. Research and development efforts should be targeted according to a priority list of pathogens developed by WHO. In addition, the Panel notes that additional measures should be taken to support access to, and the affordability of, medicines for all.

Finance and economic measures

Building a more effective global health architecture that is better prepared to respond to health crises will require additional financial resources. In the view of the Panel, investments will be needed in three key areas. First, there is a need to mobilize domestic and international funding to support the implementation of the IHR core capacity requirements. Least developed countries and other vulnerable countries should receive assistance from partners in this regard. Secondly, equipping WHO with an effective operational preparedness and emergency response capacity will require a 10 per cent increase in the organization's assessed funding, as well as the provision of adequate contingency funds for emergencies. Thirdly, at least $1 billion per annum is needed to support the research and development fund for medical countermeasures for pathogens that pose a high risk of health crises. More strategic coordination of existing resources and new funding to support these priorities can increase effectiveness and result in a safer world.

The Panel further notes that the trade and travel restrictions imposed during outbreaks often result in significant economic losses for the affected countries and the globe. They also act as a disincentive for Governments to report in a timely manner, and can hinder the response effort. As a result, the Panel recommends that measures be identified to minimize their use.

Follow-up and implementation (recommendations 26 and 27)

Inadequate political leadership at the country, regional and international levels in preparing for and responding to health crises can undermine effective and timely responses. In the view of the Panel, Heads of State and Government must initiate early and decisive actions relating to pandemics.

Moreover, previous attempts to reform the global health architecture have stalled or failed because of lack of political support.

The Panel is convinced that a high-level political mechanism is needed to maintain current momentum, ensure the implementation of crucial reforms, and to support the organization of a summit on global public health crises. The Panel therefore proposes the creation of a high-level council on global public health crises.

Conclusion

The Panel believes that, if implemented, its recommendations will serve to strengthen the global health architecture under the leadership of WHO. By building on existing mechanisms, the Panel's recommendations will strengthen global capacity to monitor risks, detect outbreaks early, and rapidly deploy a fully resourced, effective response. In addition, the Panel's proposals to dedicate resources to research and development on prioritized pathogens will ensure the greater availability of critical vaccines and treatments when they are most needed.

Recommendations

National level

Observation: The lack of compliance with the International Health Regulations (2005) (IHR) core capacity requirements affected both the preparedness for and the response to the Ebola crisis in West Africa and rendered the world vulnerable to communicable disease outbreaks.

Recommendation 1
By 2020, States parties to IHR, with appropriate international cooperation, are in full compliance with the IHR core capacity requirements.

In implementing the IHR core capacity requirements, States parties, under the leadership of Heads of State and Government, should:

Preparedness and response

- Incorporate planning for health crisis responses into national disaster risk-reduction preparedness and response mechanisms and plans
- Engage all relevant stakeholders to identify response capacities and resources
- Develop pandemic plans and carry out simulation exercises for all relevant responders, including security forces

Surveillance

- Establish a "One Health" surveillance mechanism to collect and analyse public health information in near-to-real time, combining data from all segments of society
- Ensure immediate notification of all unusual health events to the WHO Regional Director and the WHO Programme for Outbreaks and Emergencies Management (WHO centre for emergency preparedness and response — see recommendation 7)

Laboratory

- Establish at least one national public health laboratory equipped to analyse biological samples or, alternatively, ensure access to shared regional laboratories
- Develop a national system for the rapid and safe transport of samples to appropriate laboratories, including across borders

Human resources

- Define emergency workforce protocols to ensure adequate protection, training, equipment, payment and occupational safety
- Constitute an emergency workforce by training all public and private health workers in emergency protocols

Observation: One of the key obstacles to implementing a functioning surveillance and outbreak response system at the community level is the lack of trained health workers.

Recommendation 2
Governments increase investment in the training of health professionals and establish community health worker systems that are appropriate to country circumstances.

- National Governments and partners fully fund the training of community health workers
- Incentive packages are employed to help to ensure that health workers are strategically deployed in poor and remote areas
- Community health workers are recognized and integrated as a labour category with important roles in prevention, surveillance and response

Observation: Inadequate understanding of the cultural context and poorly designed messaging undermined the response at the community level.

Recommendation 3
Governments and responders strengthen and streamline their community engagement and promote local ownership and trust.

- National authorities and partners support the development and use of national social science research capacities, as well as an international network of social scientists capable of mobilizing in a crisis
- Principles of effective community engagement are featured in all training programmes for national and international responders
- National authorities and partners draw on the potential for South-South cooperation in this field
- Communication strategies are developed, with due consideration given to the cultural context

Observation: Communicable diseases frequently affect women disproportionately, since women are more likely to be the primary caregivers in a family. Moreover, women are particularly vulnerable to the adverse economic impact of disease outbreaks because they are more likely to work in the informal sector. In addition, notwithstanding the high visibility of some female response leaders, women were underrepresented throughout the national and international response to the Ebola crisis.

Recommendation 4
Outbreak preparedness and response efforts should take into account and address the gender dimension.

- Since women tend to act as primary caregivers, specific attention should be given to their needs
- Efforts to address the economic and livelihood impact of pandemics pay particular attention to the situation of women

- Women must be included at all levels of planning and operations to ensure the effectiveness and appropriateness of a response

Regional and subregional levels

Observation: While the support provided to the Ebola response effort by regional and subregional organizations significantly strengthened operational capacities, the assistance still took a long time to arrive and at times lacked coordination.

Recommendation 5
Regional and subregional organizations develop or strengthen standing capacities to monitor, prevent and respond to health crises, supported by WHO. This includes:

- Strengthening regional contingency and preparedness plans for health crisis scenarios, as well as prearranging emergency logistical and relevant medical licensing agreements that can be rapidly activated in the event of a health crisis
- Administering and operating shared regional disaster prevention and emergency response capacities, including advanced biosafety laboratories
- Enhancing regional research capacity and collaboration
- Maintaining a roster of medical experts and response staff for rapid regional deployment
- Facilitating the sharing of experiences and lessons learned among regional partners
- Maintaining, with WHO support, a commonly agreed list of pathogens posing a risk of health crises in the region
- Establishing a regional IHR update and support mechanism to strengthen compliance within the region
- Facilitating regional and subregional simulation exercises for health crisis responses, especially in border areas

International level

Observation: More than three years after the original deadline for compliance with the IHR core capacity requirements (and the granting of two extensions), only one third of the States parties to IHR have declared that they have met the IHR core capacity requirements.

Recommendation 6
WHO strengthens its periodic review of compliance with the IHR core capacity requirements.

- States parties, in consultation with non-State actors, provide the WHO secretariat with an annual written assessment of their state of implementation of the IHR core capacities

- On a rotating basis, each country is subject to a periodic review, with all States parties to IHR reviewed over a four-year period
- For countries under review, WHO arranges an independent field-based assessment of compliance with the IHR core capacity requirements, and, where available, coordinates with other reviews
- Both a country's self-assessment and the WHO-arranged assessment are presented to the World Health Assembly (or a committee created by the Assembly) for discussion
- At the review, a senior representative of the country is invited to comment on both reports. Other members of the World Health Assembly also have an opportunity to comment
- Within three months of the meeting, the WHO secretariat develops a costed action plan for each country on the basis of the discussions, using the WHO costing tool
- On the basis of the review, the WHO secretariat consolidates a public report on the global state of implementation of the IHR core capacities, and outlines an implementation strategy with requirements for international assistance
- Once a State party has achieved full compliance with the IHR core capacity requirements, the periodic review process broadens to a wider assessment of a country's health system, on the basis of guidance to be developed by WHO. This assessment includes revisiting compliance with IHR core capacities

Observation: The organizational culture of WHO is that of a technical, standard-setting organization. While the technical expertise of WHO helped to contain previous Ebola outbreaks, the organization currently lacks the experience, capability and understanding to lead large-scale operational outbreak responses. A delay in early action by WHO in response to an initial report of an outbreak may lead to the preventable deaths of thousands of men, women and children.

Recommendation 7
WHO immediately strengthens its leadership and establishes a unified, effective operational capacity.

- Taking note that WHO established the Programme for Outbreaks and Emergencies Management, but in the light of the need for unified command, the Panel proposes that such a Programme become a centre for emergency preparedness and response, with command and control authority
- The centre is the central command and control mechanism in case of health emergencies. It should be adequately funded and staffed, with clear lines of authority within the organization
- A standing advisory board is established to guide the centre in its activities. The advisory board should incorporate representatives from United Nations bodies, national Governments, NGOs and institutional partners to encourage a multisectoral approach
- During a health crisis, the centre takes full authority for the Health Cluster response and liaises closely with the Government and all actors

- The centre houses a workforce deployment management unit, to include the Global Outbreak Alert and Response Network and foreign medical team programmes, which coordinates the Global Emergency Health Workforce, deploying experts and foreign medical teams, as needed
- The centre establishes a transparent protocol to activate an immediate response to outbreaks and to call on political action where obstacles delay or prevent international action
- The centre also houses an open data platform that will collect, manage and analyse public data on epidemiological events globally. The centre will be responsible for making this data publicly available in real time
- The centre manages the proposed WHO contingency fund and has access to the pandemic emergency financing facility
- The centre collaborates closely with the WHO Health Systems and Innovation Department with regard to research and development in health crises
- The centre, in collaboration with IASC, establishes standard operating procedures for humanitarian actors operating in health crises

Observation: The effective management of a health crisis exceeds the remit of health ministries or WHO alone and requires political leadership and a United Nations system-wide response. The West Africa Ebola crisis further demonstrated the need to establish effective reporting lines within WHO as well as to improve the coordination of any system-wide response.

Recommendation 8
In the event of a Grade 2 or Grade 3 outbreak that is not already classified as a humanitarian emergency, a clear line of command will be activated throughout the United Nations system.

- The Director-General of WHO reports to the United Nations Secretary-General on the response
- The WHO Regional Director reports directly to the Executive Director of the WHO centre to ensure the coherence of the whole system
- The Executive Director of the centre will be the Secretary-General's Emergency Coordinator, who will be tasked with leading an inter-agency response, if needed
- Given that WHO is the designated lead operational agency in a health crisis response, the Secretary-General should ensure that the IASC cluster system is fully operational in supporting the Emergency Coordinator in leading an inter-agency response, if needed
- The IASC remit, including the cluster system, is reviewed to enhance robustness, timeliness, coordination and the capacity to address health crises

Observation: The Ebola outbreak exposed a lack of coherence among categorizations used for health and humanitarian crises, leading to an ineffective response.

Recommendation 9
The Secretary-General initiates the integration of health and humanitarian crisis trigger systems.

- With immediate effect, every health crisis classified as Grade 2 or Grade 3, according to the WHO Emergency Response Framework, automatically triggers an inter-agency multisectoral assessment

Development and health

Observation: The threat of health crises from communicable diseases has been recognized in Goal 3.3 of the Sustainable Development Goals. However, the monitoring and follow-up process for the Goals currently does not include compliance with the IHR core capacity requirements as a crucial element for preventing outbreaks of communicable diseases.

Recommendation 10
The international community must fulfil the commitments towards the Sustainable Development Goals, with a particular emphasis on health-sector goals.

- The Statistical Commission, in its deliberations on the indicators for the Sustainable Development Goals, should give consideration to measuring compliance with the IHR core capacity requirements and the strengthening of overall health systems as indicators towards the attainment of the health goals of the Sustainable Development Goals

Observation: The majority of official development assistance (ODA) to the health sector is directed towards vertical programmes that focus on individual health indicators. While this approach has achieved significant gains towards specific targets, it has failed to strengthen comprehensive health systems. Providing a greater proportion of funding directly to countries, including, where possible, through budget support, would enable national Governments to address these weaknesses.

Recommendation 11
Partners sustain their official development assistance to health and direct a greater percentage to strengthening health systems under an agreed-upon government-led plan.

- ODA is strategically directed to an incremental, on-budget, five-year plan of strengthening health systems
- Benchmarks for transparency and good governance in financial management are clear and consistent
- NGOs operate with the same level of transparency and good governance as is expected of national Governments

Observation: The Panel observed first-hand that strengthening health systems will be insufficient without support for complementary development programmes that focus on water, sanitation, electricity, basic health care and other related needs.

Recommendation 12
WHO works closely with development actors to ensure that development programming supports health systems and thereby helps to improve universal and equitable access to quality health.

Research and development

Observation: While there are a number of underresearched pathogens that pose a threat to humanity, it is unknown which of them will trigger the next outbreak and should therefore be a research priority.

Recommendation 13
WHO coordinates the prioritization of global research and development efforts for neglected diseases that pose the greatest threat of turning into health crises.

- The WHO secretariat, informed by advisory groups on immunization and research, creates and maintains a priority list of the communicable diseases most likely to cause a health crisis, and which, therefore, require priority attention in the development of vaccines, therapeutics and rapid diagnostics. Prioritization should be based on clearly defined criteria
- WHO helps to identify technological platforms that have the capacity to accelerate the production of vaccines and therapeutics to address disease outbreaks from novel pathogens or strains

Observation: Even where vaccines and therapeutics exist, high prices often make them unaffordable or inaccessible to those most in need. In particular, there is a need to ensure adequate access to vaccines for citizens of countries affected by an outbreak of communicable disease.

Recommendation 14
Urgent measures are taken to ensure universal access to and affordability of medicines, vaccines and other life-saving products.

- Given the gap between the need to recover investments and finance research, and the need for affordable medicines, additional public funds are made available to support universal access to and affordability of medicines, vaccines and other life-saving products
- Strengthen efforts to ensure access to and affordability of medical products through the Global Alliance for Vaccines and Immunization (GAVI), the Global Fund and other initiatives such as UNITAID
- Increase the use of generic products so as to make medicines more affordable
- Countries and partners provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health. In this context, the full flexibilities of the TRIPS Agreement should consistently be used

Observation: In the event of an outbreak, the development of medical countermeasures for a new pathogen requires that samples be quickly made available to research and development laboratories around the world. However, in recent years, there has been growing concern over the equitable distribution of

benefits, including vaccines or treatments, derived from samples made available for research and development. Despite the existence of two instruments covering the sharing of biomaterials (the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization to the Convention on Biological Diversity, and the Pandemic Influenza Preparedness (PIP) Framework), there remains considerable legal uncertainty over the conditions under which future emerging pathogen samples are shared.

Recommendation 15
WHO convenes its member States to renegotiate the Pandemic Influenza Preparedness Framework with a view to including other novel pathogens, making it legally binding, and achieving an appropriate balance between obligations and benefits, in accordance with the principles of the 2010 Nagoya Protocol to the Convention on Biological Diversity.

Observation: There is a significant disparity between the research and development capacities in developed and emerging economies, and those in the least developed countries.

Recommendation 16
WHO leads efforts to assist developing countries in building research and manufacturing capacities for vaccines, therapeutics and diagnostics, including through South-South cooperation.

- WHO and its partners accelerate technical and financial support to initiatives such as the Developing Countries Vaccine Manufacturers Network
- Efforts are made to leverage available South-South expertise
- Critical research programmes in the biological and social sciences, veterinary services, engineering and related fields are developed and supported

Financing

Observation: Financing constitutes a key constraint in implementing the IHR core capacities. While the Panel calls upon all countries to allocate a greater proportion of their national budgets to the health sector, including building IHR core capacities, it recognizes that many countries, particularly the least developed countries, will also require significant international assistance.

Recommendation 17
The Director-General of WHO leads urgent efforts, in partnership with the World Bank, regional development banks, other international organizations, partners, foundations and the private sector, to mobilize financial and technical support to build the IHR core capacities.

Observation: Currently, all WHO emergency response activities rely on voluntary funding as there are no immediately available standing resources. The voluntary nature of emergency assistance typically results in delayed and poorly coordinated responses. Core emergency response activities within WHO should therefore be financed from assessed contributions.

Recommendation 18
The WHO member States increase their assessed contributions to the WHO budget by at least 10 per cent.

Observation: Strengthening the emergency response capacities of WHO will require significant additional financial support.

Recommendation 19
Ten per cent of all voluntary contributions to WHO — beyond programme support costs — are mandatorily directed to support the centre for emergency preparedness and response.

Observation: WHO has recently established a contingency fund of $100 million to cover immediate needs in an emergency. Given the fact that an early, robust response has the greatest chance of containing an outbreak, that amount is insufficient.

Recommendation 20
Member states finance the WHO Contingency Fund for Emergencies with at least $300 million by the end of 2016.

- The Contingency Fund is available for use by Health Cluster members, under the coordination of WHO
- To ensure predictable financing, the Contingency Fund is fully funded by member States according to the scale of their current assessment. It is fully financed by the end of 2016 and immediately replenished when depleted

Observation: The absence of predictable and reliable funds with which to rapidly respond to major health crises impacts the ability of authorities to prevent disease spread. The World Bank pandemic emergency financing facility could play a key role in ensuring this predictability and timeliness.

Recommendation 21
The World Bank rapidly operationalizes the pandemic emergency financing facility.

- The annual premiums for the pandemic emergency financing facility for least developed countries are covered by additional resources from partners
- Payouts to the facility are prioritized by the national authorities of the affected country, in accordance with national response plans, with appropriate organizations providing technical support

Observation: There has been little financial incentive for industry to develop vaccines for the communicable diseases that disproportionately affect developing countries.

Recommendation 22
WHO oversees the establishment and management of an international fund of at least $1 billion per annum to support the research and development of vaccines, therapeutics and rapid diagnostics for neglected communicable diseases.

- This fund is targeted at building protection against future health crises and should supplement existing mechanisms that are supporting research and development efforts to identify vaccines, therapeutics and diagnostics for

existing endemic communicable diseases such as malaria, tuberculosis and HIV/AIDS

- The fund is used to incentivize research and development efforts on the vaccines, therapeutics and rapid diagnostics that are on the priority list of pathogens identified by advisory committees to the World Health Assembly
- Depending on each pathogen, targeted methods are used to incentivize research and development, so as to achieve rapid results with the least cost

Observation: Unilateral border closures and trade and travel restrictions caused significant economic losses and hindered the flow of responders and supplies to the Ebola-affected countries. The suspension of flights by several commercial airlines required the use of special humanitarian logistics networks.

Recommendation 23
The IHR Review Committee considers developing mechanisms to rapidly address unilateral action by States and others that are in contravention of temporary recommendations issued by WHO as part of a public health emergency of international concern (PHEIC) announcement.

Observation: The domestic impact of even local communicable disease outbreaks is amplified by the international reaction. Recent experience has shown that when a country is affected by an outbreak, other countries frequently close their borders or impose travel restrictions, in some cases in contravention of the guidance provided by WHO in accordance with IHR. These trade restrictions can be challenged both under IHR and the World Trade Organization (WTO) dispute settlement procedures.

Recommendation 24
WTO and WHO convene an informal joint commission of experts to study possible measures to strengthen coherence between IHR and the WTO legal frameworks regarding trade restrictions imposed for public health reasons.

Observation: The Panel heard concerns about the fragmentation of international efforts to support health systems in the developing world that lead to overlapping efforts and reporting requirements, a lack of coordination and a significant reduction in aid effectiveness. At the same time, many partners expressed concerns over the insufficient financial management capacities in many developing countries.

Recommendation 25
Countries and partners comply with the Paris Declaration on Aid Effectiveness, the Accra Agenda for Action and the Busan Partnership agreement, particularly with regard to the alignment of support, the harmonization of efforts and mutual accountability.

- All international actors systematically inform Governments of their aid contributions to countries and coordinate their programmes with relevant line ministries
- In an emergency response situation, the Emergency Coordinator is responsible for supporting the Government in ensuring that international assistance is effectively coordinated

Follow-up and implementation

Observation: In 2009, an outbreak of H1N1 pandemic influenza killed an estimated 300,000 people. Following the response, WHO convened a review of the functioning of IHR. The review recommended the implementation of many of the same reforms as are recommended by the High-level Panel, yet none were taken up. A lack of political leadership prioritizing implementation, coupled with insufficient resources, contributed to the lack of reforms. A high-level political mechanism is needed to monitor the implementation of the newly approved reforms, including the recommendations of the Panel.

Recommendation 26
The United Nations General Assembly immediately creates a high-level council on global public health crises to ensure that the world is prepared and able to respond to public health crises.

- The high-level council monitors political and non-health issues related to prevention and preparedness imperatives for a potential epidemic of global proportions that could have unprecedented implications on economies, movement of people and stability, as well as recovery. It will reaffirm guidance during times of health crises and will intervene in affected fields outside the health field
- The high-level council monitors and reports regularly to the General Assembly on the implementation of the adopted recommendations of the High-level Panel on the Global Response to Health Crises at the country, regional and international levels
- The high-level council ensures that the adopted recommendations of the High-level Panel are implemented in a timely manner
- The high-level council is composed of political representatives of between 45 to 50 Member States, elected by the General Assembly
- The high-level council supports the substantive preparations for a summit on global public health crises

Recommendation 27
A summit on global public health crises is convened in 2018 to focus on preparedness and response to health crises.

I. Introduction

1. The 2014 Ebola virus outbreak in West Africa resulted in the tragic loss of more than 11,000 lives and caused immeasurable suffering in communities across the region.

2. The tragedy was a wake-up call to the global community about the threat of epidemics. Communicable diseases have plagued mankind throughout history, claiming hundreds of millions of lives. And while scientific advances such as medical diagnostics, therapeutics and vaccines have reduced or eradicated some diseases, they have not been able to contain the threat posed by epidemics of new or re-emerging pathogens.

3. Many pathogens continue to spread, and new ones are regularly emerging. Climate change, population growth, biodiversity loss and the globalization of trade and travel are rendering humanity increasingly vulnerable to epidemics. The response to recent outbreaks, including Ebola and Middle East respiratory syndrome (MERS), demonstrated that the world remains dangerously ill-prepared to address the threat of epidemics. The rapid spread of these diseases highlighted the urgent need to strengthen the global health architecture to address future outbreaks.

4. To that end, in April 2015, the United Nations Secretary-General established the High-level Panel for the Global Response to Health Crises to propose recommendations that could strengthen national, regional and international systems to prevent and better respond to future health emergencies.

5. The Panel has focused its attention on health crises arising from outbreaks of new, acute or re-emerging communicable diseases that pose a threat of spreading internationally. This is not to diminish the magnitude of the health emergencies arising from non-communicable diseases, which account for the deaths of 38 million people per year. The Panel further recognizes that many endemic communicable diseases, including cholera, malaria, tuberculosis and HIV/AIDS, claim millions of lives every year, and, therefore, also qualify as major health crises. However, as these diseases have already spread across the globe, the strategy needed to contain them differs significantly from that required for the early detection of and response to outbreaks of new or re-emerging diseases. The Panel specifically focused on cases where outbreaks of communicable diseases are the root cause of a crisis, rather than the consequence of a broader emergency (e.g., a conflict-driven humanitarian emergency, or a natural disaster). Nevertheless, many of the Panel's conclusions will also apply to addressing health crises in the context of wider humanitarian emergencies. Similarly, the Panel has not explicitly examined acts of bioterrorism — that is, the deliberate introduction of communicable disease agents — although many of its recommendations will assist in containing the consequences of such acts.

6. The Panel has analysed the response to the Ebola outbreak, as well as previous outbreaks of communicable diseases, and has considered the broad range of actions and systems needed to strengthen preparedness, surveillance, alert and response in relation to health crises.

7. Since May 2015, the Panel has held extensive consultations with a wide range of actors, including the Heads of State of the most affected countries, representatives of countries supporting the response effort and other Member States, representatives of the United Nations system, multilateral financial institutions and

regional development banks, non-governmental organizations (NGOs), health-care providers, academic and research institutions, the private sector and other experts. The Panel also travelled to Guinea, Liberia and Sierra Leone — the three countries most affected by the Ebola outbreak — to consult more than 100 experts, including representatives of Governments, first-line responders, traditional leaders and local community members. Furthermore, the Panel reviewed written inputs from the Member States involved in the response, as well as numerous documents, studies and reports. The Panel further held several thematic round tables and commissioned a series of background research papers from academic institutions and practitioners. The Panel also communicated closely with experts conducting other major reviews.

8. The impact of epidemics on humanity is an untold story of suffering and millions of lives lost. The Panel hopes that its recommendations can help to strengthen the global health architecture to better respond to future outbreaks so that tragedies such as the Ebola outbreak in West Africa never happen again.

A. The 2014 Ebola outbreak in West Africa — a preventable tragedy

9. Emile Ouamouno from Meliandou, Guinea, was only two years old when he suffered a brief and intense fever and died on 28 December 2013. Likely transmitted through contact with an infected fruit bat, the virus that killed Emile spread quickly and ultimately led to the deaths of his sister Philomene, his pregnant mother Sia, and his grandmother Koumba. When Koumba sought treatment at the hospital in nearby Guéckédou, the infection spread to health workers, who, in turn, unknowingly carried it to other villages.

10. At the end of January 2014, Guinean authorities dispatched a team of local health workers to Meliandou to investigate the mysterious deaths, but the team failed to diagnose the disease. It was not until the end of March 2014 that the Ebola virus was identified and reported to WHO in Geneva. By that time, 49 cases and 29 deaths had been registered and the disease had already spread to neighbouring Sierra Leone.

1. The Ebola virus

11. Ever since its discovery in the tropical forests of northern Democratic Republic of the Congo in 1976, the Ebola virus has instilled fear wherever it appeared. Deeply aware of the powerful and highly contagious nature of the virus, the researchers who first identified it chose to contravene regular practice by naming it not after the village of discovery, but after the nearby Ebola River. They hoped that this would help spare the people of Yambuku village from stigma and reprisals.

12. Despite the virulent nature of the pathogen and the lack of public health and medical infrastructure in the areas where it first surfaced, earlier Ebola outbreaks were comparatively limited in scope, affecting only one or two towns or villages before being contained. Between 1976 and 2012, 24 such outbreaks occurred in Africa, mostly in the Democratic Republic of the Congo, Gabon, South Sudan and Uganda. Two of the three largest outbreaks occurred in the Democratic Republic of the Congo: The initial outbreak in Yambuku resulted in 318 cases and 280 deaths, while an outbreak in 1995 in Kikwit led to 315 cases of infection and 250 deaths.

The third largest outbreak took place around the northern Ugandan town of Gulu in 2000, where it infected 425 people and killed 224.

13. Against this backdrop, it is not surprising that when Guinea declared a new outbreak of Ebola virus on 22 March 2014, the world assumed that it would quickly die down as it had done in previous outbreaks. But this time was different.

2. Underestimating the challenge

14. In the affected countries, national and local authorities initially played down reports of an Ebola outbreak for political reasons. The Panel also heard that while NGOs and first responders were allowed to do their work, they were not always given the support they needed.

15. At the same time, WHO and other agencies misjudged the scale of the threat and their initial response was widely inadequate. Following the confirmation of the Ebola outbreak, over the course of March 2014, WHO sent 38 people to Guinea. By comparison, in December 2014 the number of WHO personnel in West Africa totalled 338.

16. It would take another four and a half months for WHO to recognize the Ebola outbreak as a public health emergency of international concern (PHEIC). Meanwhile, the virus continued to spread. Between March and June 2014, the disease was transmitted to Liberia and Sierra Leone, with the number of suspected and known cases more than tripling from 112 to 389.

17. A lack of awareness, including among health professionals, accelerated transmission of the virus. As a result, hospitals often became centres of infection. On the other hand, insufficient knowledge about the communicable nature of the disease led some families to treat their sick at home, therefore exposing themselves to great risk of infection. Efforts to sensitize the population on the need for safe burials often encountered resistance, as cultural norms require extensive burial rituals that include the touching and washing of a deceased's body. In one case, a traditional burial ceremony was linked to more than 365 new cases of Ebola.

18. Containing an Ebola outbreak is a challenge for any health system. If the United States of America and Spain — two countries with some of the most developed health systems in the world — were unable to prevent the transmission of Ebola at their hospitals, the size of the challenge facing the three West African countries becomes all-the-more apparent.

19. Even before the arrival of Ebola, the three most affected West African countries had highly inadequate health-care systems and infrastructure and ranked among the lowest 15 countries in the world in terms of human development. In Guinea, there are 10 doctors for every 100,000 persons, compared with the United States, where there are 242 doctors for every 100,000 citizens. In Liberia and Sierra Leone, the figures are worse. In 2012, not one of the three countries spent more than $13 per person on health.

3. Spiralling out of control

20. In July and August 2014, the Ebola outbreak had reached the capitals of Guinea, Liberia and Sierra Leone. Transmission rates accelerated, with total case

numbers doubling every month. At the end of June, there were 779 cases; at the end of July, there were 1,609 cases; and at the end of August, there were 3,707 cases.

21. Tragic scenes unfolded on the streets of Monrovia and Freetown, and in the treatment centres in rural areas. People were dying at the gates of overflowing treatment centres. Health-care workers were at great risk of infection and suffered accordingly, with close to 500 dying over the course of the crisis.

22. By the end of July, the situation had reached a tipping point and local governments and the international community had been galvanized into action. On 23 July, it was announced that Ebola had reached Nigeria, and in August and October, the virus had spread to Senegal and Mali, respectively.

23. On 2 and 5 August 2014, the first American and Spanish patients with Ebola were medically evacuated to their home countries. The arrival of Ebola in the developed world sparked growing global media attention to the disease.

24. On 8 August, four and a half months after the discovery of the outbreak, WHO declared the Ebola outbreak a PHEIC.

4. Mounting a response

25. The declaration by WHO of a PHEIC led a number of partners to commit significant assistance for the Ebola response. On 19 September, following the adoption of resolutions by the United Nations General Assembly and the Security Council, the Secretary-General established the United Nations Mission for Ebola Emergency Response (UNMEER).

26. In the ensuing months, the international community mobilized the largest ever epidemic response effort in history. Under presidential leadership, the national Governments of the three affected countries put in place crisis coordination mechanisms and oversaw the engagement of thousands of national response workers, including medical support staff, contact tracers and community sensitizers. Numerous international partners provided more than $6 billion in financial support, as well as material contributions, including personal protective equipment, chlorine solution for disinfection, cars, motorcycles, tents and mobile computing and communications equipment. Governments, foundations and private sector institutions ramped up efforts to develop a vaccine for the Ebola virus.

27. Hundreds of international medical staff were sent to the region. Military logistics and medical capacities were deployed by France, the United Kingdom of Great Britain and Northern Ireland and the United States. A number of NGOs led the response on the front lines by staffing Ebola treatment centres, training and leading safe burial teams and contact tracers, and sensitizing local communities. The efforts of Médecins sans frontières and the national Red Cross and Red Crescent Societies deserve particular mention in this regard.

28. In the early days of the crisis, a poor understanding of the problem, coupled with ad hoc coordination, meant that the response efforts were not always effective. For example, early messaging about Ebola portrayed the disease as a death sentence, leading suspected patients to go into hiding rather than undergo testing.

29. Despite these challenges, international response efforts and behavioural changes in affected communities eventually arrested what could have been an exponential spread of the Ebola virus. The number of new cases per week peaked at

around 900 in September and October, and began to decline thereafter. By the end of January 2015, the weekly new caseload had declined to around 120. After remaining at this level for three months, the average declined to about 30 cases per week in March, and below 10 per week in June, and to less than 5 per week in August 2015.

30. After several months of clinical trials, on 31 July 2015, researchers in Guinea reported positive results from an experimental Ebola vaccine. Since then, the experimental vaccine has begun to be used to support the response efforts.

31. When the number of new infections dropped to zero for 42 days (twice the incubation period), WHO declared countries "free from Ebola transmission". After Liberia was first declared Ebola-free on 9 May 2015, the country subsequently saw two clusters of cases re-emerge as a result of transmission by survivors. Liberia was once more declared Ebola-free on 14 January 2016. Highlighting the continuing dangers of re-emergence, the very same day Sierra Leone reported a new Ebola death, despite having been declared Ebola-free on 7 November 2015. At the time of writing, Guinea had been declared free from Ebola transmission on 29 December 2015.

32. The outbreak led to 28,638 infections and claimed 11,316 lives.[1] While the worst of the outbreak is likely to be over, the virus continues to pose a deadly threat in the region.

5. Broader impact

33. The Ebola outbreak also had a broader socioeconomic impact on public health systems, livelihoods, education, employment, trade and the economy, which is likely to claim a much larger number of lives. The economic loss to the three countries alone is estimated at $2.2 billion, or 16 per cent of the combined gross domestic product (GDP).

6. A preventable tragedy

34. The Ebola outbreak in West Africa was a preventable tragedy. If the outbreak had been detected faster, and concerted international action had been mounted more rapidly, the spread of the disease could have been contained and thousands of lives could have been saved. The present report is for those who should still be with us today.

B. The global burden of communicable diseases

35. For centuries, the world has been subjected to frequent outbreaks of epidemics, with often devastating consequences. In the fourteenth century, the largest outbreak of the bubonic plague reduced the populations of Africa, Asia and Europe by an estimated 50 million. Dozens of less virulent outbreaks of the plague have been recorded in modern history, with many claiming tens of thousands of lives. Other communicable diseases, such as smallpox, cholera, typhoid and measles caused the death of additional millions. Brought to the Americas by European settlers, smallpox is thought to have killed millions of Native Americans in the

[1] Data as at 17 January 2016. Accessed 22 January 2016 from www.who.int/csr/disease/ebola/en.

sixteenth century. In 1918, a pandemic of H1N1 influenza killed an estimated 50 million persons. Over the past century, the death toll from communicable diseases has been similar to the number of people killed in conflict and natural disasters, even though the latter two receive far more attention.

36. Today, a number of other communicable diseases continue to claim millions of lives. For example, malaria, the most prevalent vector-borne disease globally, causes close to half a million deaths annually. Tuberculosis continues to affect millions of people in low- and middle-income countries, infecting 9.6 million people in 2014, leading to 1.5 million deaths. Seven pandemics of cholera, a severe and acute bacterial diarrhoeal disease, have occurred since 1965. Estimates suggest that 1.4 to 4.3 million cholera cases annually contribute to as many as 143,000 deaths globally. Also, HIV/AIDS continues to affect the lives of more than 36 million people worldwide.

37. Furthermore, genetic mutations and human influences on ecosystems cause new pathogens to emerge every year. More than 300 new communicable diseases are reported to have emerged between 1940 and 2004 alone. Around 75 per cent of emerging communicable diseases are zoonotic. While not all of these diseases currently prove harmful to humans, a small proportion — including anthrax and rabies — hold the potential for devastating consequences. Rapid urbanization and deforestation, as well as the interaction between underdeveloped infrastructure and sanitation and the high density of livestock create a high-risk environment for the transmission of zoonotic diseases. Conflict, population movement and limited access to health services also provide fertile ground for a mixing bowl of new and old diseases.

38. Mutations can also render existing diseases resistant to treatments. Examples of such mutations have occurred with strains of HIV in Africa, tuberculosis in China, India and the Russian Federation and malaria in South-East Asia.

39. Newly emerged diseases hold a particular threat. The severe acute respiratory syndrome (SARS) coronavirus led to over 8,000 cases and 750 deaths (a 9.6 per cent fatality rate) in several countries in 2003. The H1N1 virus, which was responsible for the influenza pandemic of 1918, reappeared in a slightly different form in 2009, causing severe respiratory illness. The outbreak is estimated to have caused the deaths of almost 300,000 people globally in one year. Another strain of the flu virus, H5N1, or Avian Influenza, caused more than 130 outbreaks between 2006 and 2008 alone in countries including China, Egypt, Indonesia, Pakistan and Viet Nam. Between 2012 and 2015, MERS, which, like SARS, is caused by a coronavirus, was responsible for over 500 deaths. In mid-2015, the Republic of Korea experienced a large MERS outbreak that infected 186 people and resulted in 36 deaths. More than 16,000 people were quarantined to prevent the widespread transmission of the disease.

40. Communicable diseases have always posed a threat to humanity. However, growing interconnectedness through travel, trade and transport is facilitating their spread around the globe at a faster rate than ever before. Burgeoning international travel for business and recreation has moved people and products in unprecedented numbers, expanding the opportunities to spread pathogens to new populations and remote areas. During the SARS epidemic in 2003, an infected individual who spent one night at an international hotel in Hong Kong, China, caused multiple infections of other guests, who then carried the virus to three other countries within 24 hours.

41. Despite the devastating consequences of the Ebola outbreak in 2014, the Ebola virus is not the most virulent pathogen known to humanity. Case fatality rates for Ebola outbreaks range from 25 to 90 per cent, with an average of 50 per cent. But the list of known pathogens includes a number of others — such as plague and smallpox — that are marked by higher average case fatality rates. Furthermore, the Ebola virus is transmitted only by contact with the body fluids of a symptomatic patient.[2] It is therefore easier to contain than an airborne disease, especially in situations where a virus can be transmitted before an individual becomes symptomatic. Experience with the Ebola outbreak in West Africa has shown that — before successful control measures were initiated — each case of Ebola on average resulted in two further infections. In the case of SARS, this reproduction number is estimated to range between 2 and 5, and for measles, between 12 and 18.

42. While the source and virulence of the next emerging pathogen are difficult to predict, there is a significant risk that the next major outbreak could be far more severe than the Ebola outbreak. The greatest concern is the emergence of a virulent strain of a highly communicable pathogen — such as influenza virus — that could result in millions of deaths. Should this occur, its impact could far outweigh that of the influenza pandemic of 1918. Mathematical modelling of pathogen spread has shown that such a disease could spread to all major global capitals within 60 days, and kill more than 33 million people within 250 days.

43. The emergence of such a virulent pathogen is entirely within the realm of possibility. Recent research has shown that only five genetic mutations of the H5N1 virus are necessary for this highly pathogenic virus to become airborne. Two of these five genetic mutations are now common in nature, and a third has already been observed.

C. The broader socioeconomic impact of health crises

44. The global impact of health crises from epidemics goes far beyond morbidity and mortality. They also have significant socioeconomic consequences that often affect a far greater number of people than the underlying disease. In the case of the SARS outbreak in 2003, the global economic impact was estimated at $40 billion. These socioeconomic effects contribute to a downward spiral of vulnerability as resilience and coping capacities are eroded by income loss.

45. Efforts to contain epidemic spread often include the imposition of restrictive measures, such as the cancelling of major events, the closing of schools and markets, and the unilateral imposition of travel restrictions and quarantines, which may result in adverse economic effects. Even where such measures are not officially enforced, fear and panic may lead populations to avoid crowded spaces. Markets are abandoned and production plummets, causing economies to contract. Following the Ebola outbreak in Guinea, rice production fell by 20 per cent in 2014 compared with 2013, coffee production by 50 per cent and cocoa production by 33 per cent. Both self-employment and wage-employment decreased. In Sierra Leone, the outbreak

[2] In the 2014 Ebola outbreak in West Africa, individual cases of sexual transmission of Ebola virus disease by male Ebola survivors have been suspected, but have not yet been proven. More surveillance data and research are required on the risks of sexual transmission, particularly on the prevalence of viable and transmissible virus in semen over time. See WHO FAQ on Ebola, http://www.who.int/csr/disease/ebola/faq-ebola/en/. (Accessed 24 November 2015.)

led to the loss of an estimated 180,000 jobs. A report issued in July 2015 by the United Nations Entity for Gender Equality and the Empowerment of Women entitled "Ebola impact revealed", noted that, among assessment participants in Liberia, "unemployment ... has soared from 18.8 per cent before Ebola to 56.2 per cent since the outbreak began, leading to huge income deficits in households. Small businesses have collapsed, markets have closed down, and farming activities have been abandoned". Women have been disproportionately affected by these trends since the majority of employed women are occupied in the informal sector, which includes small trade and food preparation.

46. The domestic impact of local communicable disease outbreaks is amplified by the international reaction. Recent experience has shown that when countries are affected by outbreaks, tourism and international trade collapse. Other countries close their borders or impose travel restrictions, in some cases in contravention of the guidance provided by WHO. In Guinea, fishery exports fell by 40 per cent, while rubber exports experienced a similar decline in Liberia. In all three Ebola-affected countries, international investors postponed new projects or pulled out altogether. As airlines suspended flights and potential visitors changed their plans, hotel occupancy fell sharply. Several countries imposed outright bans on the entry of people from Ebola-affected nations, while approximately 70 countries imposed more than 500 different measures, such as restrictions on travellers from the affected countries, which exceeded the measures recommended by WHO. These reactions confirmed the fears of the Governments of the most affected countries about how the international community would react once the outbreak was confirmed and declared a PHEIC. It was these fears that contributed to the initial delay in reporting the outbreak.

47. According to a World Bank estimate of April 2015, the total economic cost of the Ebola outbreak in the three affected countries was $2.2 billion, just over 16 per cent of their collective GDP.

48. However, the economic effect of epidemics usually extends far beyond the affected countries alone. Inappropriate international reactions, based on uncertainty and fear, mean that even countries not affected by an outbreak are penalized. In the case of the SARS outbreak, several unaffected countries in East Asia experienced a 15 to 35 per cent reduction in travel bookings. West African countries unaffected by Ebola in 2014 registered similar declines. The Gambia, which has never had a case of Ebola virus disease, saw a 65 per cent decrease in tourism, a sector that accounts for 16 per cent of its economy. The overall loss to the wider West African region has been estimated at $1 billion. The MERS outbreak in the Republic of Korea was associated with decreased consumer spending and a 40 to 60 per cent drop in the number of tourists, spurring the Government to launch a $19 billion fiscal stimulus plan.

49. The economic costs of epidemics can affect overall poverty levels and create food insecurity. As noted in a recent publication by the United States National Academy of Sciences, "Every year 150 million people, mostly in low- and middle-income countries, fall into poverty because of health expenses; millions more stay poor because they are too sick to work". Poor health indices are inextricably linked to poverty and low GDP, and they strain limited resources. In West Africa, the Ebola outbreak reversed recent gains in poverty reduction, and rising prices for staple foods — combined with income shocks from employment losses — led to

heightened food insecurity. In November 2014, the World Food Programme (WFP) estimated that 200,000 persons had become food insecure owing to Ebola.

50. Disease outbreaks also often undermine progress in education and the long-term development prospects of a generation of children. Protracted school-closures threaten long-term adverse effects on human development indicators, including health, skills-development and economic growth. In the three Ebola-affected countries of West Africa, schools remained closed for more than five months, depriving an estimated 5 million children of educational opportunities.

51. If the Ebola outbreak proved devastating to the affected West African countries, it provides an indication of the possible impact of a more global outbreak of a communicable disease. In comparison, the World Bank estimates that a severe influenza pandemic could result in $3 trillion in global economic losses, equivalent to 4.8 per cent of global GDP. Most of these losses would not be caused by disease directly, but rather by consumer reactions, labour shortages and cascading failures in the economic and financial sectors.

D. Communicable diseases — diseases of poverty

52. Epidemics of communicable diseases pose a threat to all. MERS and SARS have shown that even high-income countries are not immune. However, the weakest and most vulnerable populations will almost always suffer the longest and the most.

53. Poverty remains the most significant obstacle in global efforts to prevent and respond to communicable disease outbreaks and epidemics. While communicable diseases can arise anywhere in the world, it is easier for pathogens to go undetected and for diseases to spread in areas where levels of development are low and basic services are poor. Low sanitary and hygiene standards, poor sanitation infrastructure and a lack of access to potable water facilitate infection. Malnutrition weakens the immune system, while low levels of health education contribute to the emergence and spread of disease. Consequently, the populations living in these environments are more susceptible to disease compared with people in more developed environments, where diseases are better contained. The H1N1 influenza pandemic of 2009 is estimated to have killed 12,469 persons in the United States, but its estimated death toll in Africa and South-East Asia was 10 times higher.

54. The nearly 1 billion people living on less than $2 per day are not only at higher risk of communicable diseases, but are also more vulnerable to their impact than people in higher income brackets. Those most at risk have the least means to respond. In most developing countries, health systems are weak. Hospitals may lack electricity or running water, and there are often not enough medical doctors, nurses or midwives. Staff lack training and essential equipment, and drugs are often unavailable or must be purchased by patients. These shortcomings mean that acute and long-term health care is not accessible to the majority, especially to those who lack financial resources.

55. The Ebola outbreak vividly demonstrated the difference between the impacts of an epidemic in countries with strong versus countries with weak health systems. While Ebola killed more than 11,000 people in the three most affected countries, its importation into countries with stronger public health systems and capacities was stopped after very few transmissions. Nevertheless, the successful containment of

the outbreaks in Mali, Nigeria and Senegal shows that good preparedness and proactive responses can help to halt epidemics even in the context of comparatively weak health systems.

E. A world unprepared

56. In the light of the global threat from epidemics, the international community has made significant efforts to protect itself better and reduce its vulnerability. However, these efforts have not been sufficient to meet current and future threats.

57. Efforts to strengthen collaboration in fighting communicable disease date back to 1851, when the first International Sanitary Conference was convened in Paris to agree on a set of measures to control the transborder transmission of cholera. Negotiations eventually resulted in the adoption of a set of International Sanitary Regulations in 1892, which required signatory countries to notify all outbreaks of key communicable diseases (including plague, cholera and yellow fever), thereby allowing other countries to take protective measures. At the same time, the regulations required that any protective measures such as quarantines should avoid unnecessary interference with international trade and travel. The International Sanitary Regulations were revised several times to update the list of notifiable diseases and renamed International Health Regulations (IHR) in 1969.

58. Today, IHR remain the linchpin of the international community's system to address health crises arising from communicable disease outbreaks. While IHR are not a guarantee against epidemics and pandemics, they nonetheless prescribe a structure and tools for preventing and responding to outbreaks.

59. The current IHR are the result of a significant revision process that began after the Ebola outbreak in Kikwit, Democratic Republic of the Congo in 1995. Agreed upon in 2005, the revised IHR have four major changes compared with their predecessor. First, the scope of IHR has been broadened from a closed set of notifiable diseases to an open set of all health "events" that meet at least two of four criteria: (a) a potentially serious public health impact; (b) an unusual or unexpected nature; (c) the presence of significant risk of international spread; and (d) a significant risk of international trade and travel restrictions. Secondly, the focus of IHR has shifted from the protection of unaffected countries through border measures towards detecting and containing a disease at its source. IHR provide for a series of measures to assist affected countries rather than focus only on limiting cross-border transmission. Thirdly, IHR recognize that countries require improved capacities for effective surveillance and monitoring, and prescribe a list of necessary core capacities that were intended to be implemented by all States parties by 2012. Fourthly, they provide the Director-General of WHO with the authority, on the advice of an Emergency Committee, to alert the world to a health event of global concern by declaring a PHEIC.

60. However, the failure to detect and respond rapidly to outbreaks of communicable diseases, including Ebola, demonstrates that the systems currently in place do not yet provide adequate levels of protection and preparedness. Few countries have built the core capacities for surveillance and alert required by IHR. Similarly, when an outbreak is declared, many countries continue to impose trade and travel restrictions in contravention of IHR. This lack of compliance highlights the difficulties associated with international agreements that create onerous

performance requirements without offering incentives or financing to support implementation.

61. Global efforts to protect against pandemic threats also rely on the development of medical treatments and vaccines to combat several pathogens. A 14-year WHO-sponsored vaccination programme resulted in the successful eradication of smallpox in 1980, ensuring that millions of people did not succumb to one of the biggest killers in history. Similarly, the number of cases of poliomyelitis has been reduced by 99 per cent. However, only an insignificant proportion of the research and development financing for vaccines and medical treatments has been devoted to diseases such as Ebola that primarily affect the least developed countries. As a result, at the beginning of the Ebola outbreak in 2014 — a full 40 years after the disease was first discovered — there was still no vaccine or treatment for the Ebola virus.

62. The Ebola outbreak in West Africa in 2014 exposed important gaps in the existing mechanisms to address health crises. In its consultations, the Panel was able to identify gaps at all levels — local community, national, regional and international — and with regard to a number of cross-cutting issues. The most acute gaps relate to the lack of IHR core capacities for public health surveillance and response; the broader weakness of health systems in many countries; and inadequate governance mechanisms and capacities for preparedness, detection and response at the regional and international levels.

63. Drawing on the lessons from the Ebola outbreak and other communicable disease outbreaks, the following sections outline the key shortcomings of the existing system to address the threat of communicable diseases. Each section also includes relevant recommendations. Section II will address the challenges identified at the local and national levels. Section III will discuss the gaps identified at the regional level, and section IV will outline the problems identified at the international level. Section V addresses a number of cross-cutting issues. However, successfully addressing these gaps does not obviate the need for rapid and appropriate leadership and political decision-making. The Ebola crisis laid bare the tragic absence of responsible and timely action by leaders at all levels. Against this backdrop, section VI outlines a proposed high-level political monitoring mechanism to ensure the implementation of the reforms needed to build a global health architecture that can better respond to future health crises.

II. National level

64. The local community is on the front line of any outbreak, and the State is the primary actor responsible and accountable for issuing appropriate alerts and responding to the crisis. It is at these levels that capabilities in prevention and preparedness are needed to identify new outbreaks and to ensure a coordinated, robust response.

65. The establishment of comprehensive national early warning and response systems to deal with health crises is a complex task involving multiple actors at different levels.

66. An effective early warning system requires deploying staff with at least basic training in all communities to monitor public health data and notify any unusual

health events through a national health information system to the ministry of health. It also requires having adequate staff with epidemiological expertise to analyse information about unusual health events and then cross-check it with inputs supplied by other sources, including veterinary actors. If deemed necessary, diagnostic teams must be deployed to investigate unusual cases. These teams must also have access to laboratory capacities to test samples and to provide rapid test results. If necessary, the ministry of health and WHO must be notified of unusual results and a predefined and well-rehearsed national preparedness plan for epidemic response must be triggered. All staff participating in an emergency response must know their role and work within clear and predefined reporting lines. Any emergency response plan should also provide for the pre-positioning of medical supplies.

67. Containing an advanced outbreak of a communicable disease such as Ebola requires the quick identification of all those infected and their transfer to isolation and treatment centres, where strict Infection Prevention and Control measures have been put in place. Also, all contacts of each infected patient have to be identified and, if no vaccine is available for rapid use, regularly monitored. In the case of Ebola, monitoring contacts was required on a daily basis for 21 days. If a patient dies, the body must be buried in a way that does not pose a risk of infection. Moreover, the whole population must be informed about the risks of infection and about the measures they can take to prevent exposure. Implementing these measures requires the mobilization of significant financial, material and human resources, and close coordination among a number of government ministries, local authorities, partners, international agencies, NGOs, the private sector and civil society organizations.

68. Building an effective early warning and alert system and mounting a coherent and robust response to a communicable disease outbreak is a challenge in any country in the world. This was illustrated by the difficulties faced by China in addressing the SARS outbreak in 2003 and by the Republic of Korea in dealing with MERS in 2015. The task is particularly demanding in least developed countries such as Guinea, Liberia and Sierra Leone.

69. The Panel found that at the national level, the key measures needed to build a more effective system to monitor, detect and respond to health crises are: (a) implementing IHR core capacities and strengthening health systems; (b) building an effective health workforce; (c) addressing governance challenges; (d) strengthening community engagement; (e) training the military for health and humanitarian missions; (f) ensuring the continuation of essential health services; and (g) addressing the gender aspects of health crises.

A. Implementing the International Health Regulations core capacities and strengthening health systems

70. The delay in responding to the Ebola outbreak in West Africa exposed the critical gaps in preparedness, surveillance and response that continue to exist in many developing countries.

71. The current legal framework governing international cooperation on the control of communicable diseases, IHR, requires that each of its 196 States parties put in place a set of core capacities for surveillance and response to outbreaks of dangerous new pathogens and report them to WHO. These core capacities include

national legislation, policy and financing, coordination and national focal point communications, surveillance, response capacities, preparedness, national risk communications, human resources and laboratory services.

72. The Ebola outbreak showed that significant gaps persist in the implementation of the IHR core capacities in West Africa. Yet, the region is not alone in lacking core capacities.

73. To date, only a third of the 196 States parties to IHR have reported that they are in full compliance with the IHR core capacity requirements. This is despite two extensions of the original deadline for implementation. When IHR entered into force in 2007, countries were given an initial deadline of June 2012 to comply with the core capacity requirements. At that time, only 42 of the then 193 States parties declared that they had met the requirements; for that reason, an additional two-year extension until 2014 was requested by and granted to 118 States parties. At present, 65 States parties (33 per cent) have indicated that they have met the minimum core capacity standards; 84 (43 per cent) have requested an additional two-year extension; and 44 (22 per cent) have not communicated their status to WHO. In May 2015, the World Health Assembly granted a further extension of two years for all countries having requested it, bringing the deadline for full IHR compliance to 2016.

74. Achieving compliance with all components of the IHR core capacities — and ensuring coverage that extends beyond a country's capital — is a key step towards ensuring there is effective preparedness and capacity to respond to health crises. The Panel urges all countries to give priority to building the required capacities and proposes a number of mechanisms to support developing countries in doing so. However, the Panel recognizes that even with significant international assistance, it will be difficult for many of the 128 non-compliant countries to meet the IHR core capacity requirements by 2016. The Panel suggests that 2020 is a more realistic and achievable goal, provided that supporting mechanisms are put in place.

Recommendation 1

By 2020, States parties to IHR, with appropriate international cooperation, are in full compliance with the IHR core capacity requirements.

75. Strong international cooperation in sharing technical expertise and resources will be needed to achieve this goal. Many countries, and least developed countries in particular, will require both financial and technical assistance. In this context, the Panel recommends the creation of a periodic review mechanism on compliance with the IHR core capacity requirements to identify gaps (see recommendation 6), as well as the allocation of additional resources to address these gaps (see recommendation 23).

76. At the same time, national authorities must also live up to their responsibilities and commit to an incremental long-term domestic resource allocation strategy to implement the core capacities, with the ultimate goal of full domestic financing of a functioning public health system capable of effective surveillance and the early detection of and response to outbreaks. Domestic financing will strengthen local ownership and ensure long-term sustainability. Meeting the Abuja targets will allow for part of additional government spending to be devoted to developing core capacities. In April 2001, the Heads of State of African Union countries met in Abuja, and committed to allocating at least 15 per cent of their national budgets to

health.[3] More than 10 years on, very few African Union countries have achieved the Abuja target, a reflection of the fact that the Governments of many low- and lower middle-income countries do not prioritize health spending. In 12 low-income countries, government expenditure on health is just over half of the Abuja target (8 per cent), which equals average government health spending of $12 per capita per year, an amount far too small to provide even the most basic services. In 2012, public spending on health in Guinea, Liberia, and Sierra Leone was $9, $12 and $13 per person, respectively. This is much lower that the target set by the Global Health Security Working Group on Health Financing convened by Chatham House, which recommended a minimum of $86 per capita for government expenditure on health (in 2012 dollars). However, in the light of their numerous financing needs, the Panel is of the view that the least developed countries should only be required to make additional domestic resources available for the implementation of core capacities if their partners also provide new and additional funds for the purpose. In this context, co-financing mechanisms should be developed.

77. The Panel further notes that in many countries, the implementation of the IHR core capacity requirements has, in the past, been seen as a task for the health authorities, and has not always received adequate attention from Heads of State and Government. In the light of the key role that the IHR core capacities play in building preparedness against a major health threat, their implementation should be overseen by the Head of State or Government.

78. While compliance with all IHR core capacities is important, the Ebola outbreak demonstrated that, with regard to preparedness, surveillance, laboratories and human resources (workforce), particular attention should be paid to implementation in the following areas.

1. Preparedness and response

79. In many countries, the level of preparedness for disease outbreaks is extremely low. Challenges include non-existent national emergency plans and a lack of designated health emergency coordination structures and regular exercises to prepare for epidemic responses. Stockpiles of medical equipment and logistical support tools are often inadequate. And lists of medical and response personnel with adequate training who can be called on in an emergency are often out of date or non-existent.

80. To improve the level of preparedness, national Governments, under the leadership of Heads of State and Government, should:

- Incorporate planning for health crisis responses into national disaster risk-reduction preparedness and response mechanisms and plans
- Engage all relevant stakeholders to identify response capacities and resources
- Develop pandemic plans and carry out simulation exercises for all relevant responders, including security forces

[3] Abuja Declaration, adopted on April 27, 2001 at the African Summit on HIV/AIDS, Tuberculosis and Other Related Infectious Diseases, held in Abuja.

2. Surveillance

81. Disease surveillance and detection capabilities are also very limited in several countries. More than three months had elapsed before the recent Ebola outbreak in West Africa was recognized, whereas it took an average of 44 days to identify the virus in earlier outbreaks. In the case of the recent outbreak in West Africa, some health specialists had suspected an atypical disease but their suspicions were not widely shared, given that Ebola was not thought to occur in the subregion[4] and shares many symptoms with other common diseases. The delay in recognizing the virus highlights the challenges facing many least developed countries that lack a critical mass of communicable disease expertise.

82. In West Africa, the quality of real-time surveillance systems and epidemiological data-collection management and reporting across the population is mixed. Countries in the region generally designate health facilities to be routine surveillance sites that use the WHO Integrated Disease Surveillance and Response framework. The framework focuses surveillance on a limited number of priority diseases and/or syndromes to determine trends over time and place. While the framework emphasizes the integration of data, there are also a number of more vertical surveillance networks that crisscross the African continent. They include surveillance networks for polio, influenza, meningitis, rotavirus and vaccine-preventable diseases such as measles. Because they report vertically, the information they report is not routinely incorporated into the framework at the national or regional levels. Despite the fragmentation caused by this mixture of vertical and integrated surveillance, more than half of the countries of Africa regularly produce a national feedback bulletin, with aggregate totals of cases and deaths drawn from all surveillance systems. They also report results from performance indicators such as timeliness of reporting. The bulletins provide updates about emerging health events and outbreaks, laboratory reports, and the current status of response actions, but the quality, completeness and timeliness of the information that is reported tends to vary and can often be unreliable. For example, an estimated 1 in 4 children in Guinea does not have a birth certificate — a key mechanism for monitoring the state of public health — since authorities do not have adequate capacity to regularly collect information on births and deaths.

83. The Panel further noted that there is a need to improve the linkage between the human and veterinary health surveillance systems, in line with the principle of "One Health", since it is estimated that more than half of all human communicable diseases are zoonotic.

84. Against this backdrop, national Governments need to strengthen their national surveillance networks and work with partners to ensure better integration among existing surveillance networks. Given the existing capacity constraints in many countries, national Governments should also provide all data related to abnormal health events to the WHO Regional Director and the WHO Programme for Outbreaks and Emergencies Management (WHO centre for emergency preparedness and response — see recommendation 7), who in turn can provide expert advice from adequately qualified staff, if needed.

[4] However, at least one previous study had identified the presence of Ebola antibodies in populations in the affected countries, although these results were not common knowledge in the region or among experts. Bernice Dahn and others, "Yes, we were warned about Ebola, *New York Times*, 7 April 2015, available from www.nytimes.com/2015/04/08/opinion/yes-we-were-warned-about-ebola.html?_r=0. (Accessed 22 January 2016).

85. To improve effective disease surveillance and monitoring, national Governments, under the leadership of Heads of State and Government, should:

- Establish a "One Health" surveillance mechanism to collect and analyse public health information in near-to-real time, combining data from all segments of society
- Ensure immediate notification of all unusual health events to the WHO Regional Director and the WHO Programme for Outbreaks and Emergencies Management (WHO centre for emergency preparedness and response — see recommendation 7)

3. Laboratory capacity

86. While initial surveillance can identify unusual health events, laboratory testing is required for a definitive diagnosis. However, many countries have extremely limited laboratory capacity. During the recent Ebola outbreak, the first samples were sent for initial confirmation to Biosafety Level 4 laboratories in Lyon, France, and Hamburg, Germany. Laboratory diagnostics for Ebola in Guinea were only provided when teams from the Institut Pasteur Dakar and the European Mobile Laboratory were deployed at the end of March 2014. Limited access to laboratory services and the slow return of test results limited the effectiveness of the response by making it difficult to analyse transmission chains and conduct contact tracing. The Panel further learned that often, the lack of pre-agreed systems and protocols for the transport of samples to laboratories, especially across borders, can pose an obstacle to rapid testing.

87. To strengthen their laboratory capacities, national Governments should:

- Establish at least one national public health laboratory equipped to analyse biological samples or, alternatively, ensure access to shared regional laboratories
- Develop a national system for the rapid and safe transport of samples to appropriate laboratories, including across borders

4. Human resources

88. The three countries most affected by Ebola suffered crucial shortages in health workers and other qualified response workers (see also recommendation 2). When the Ebola outbreak accelerated, efforts were made to rapidly employ additional staff to support the response — for example, as contact tracers or safe burial teams — and to train them in their respective tasks. Mechanisms also had to be put in place to support the payment of the additional staff.

89. While achieved at record speed, the training of surge staff and the creation of administrative structures to support them cost valuable response time. In the future, countries should identify core surge capacities in advance as part of their national preparedness plans and ensure that staff is trained in Infection Prevention and Control as well as in generic outbreak-response functions. The capacities of the private health-care system should be included in the surge capacity for national health emergency responses.

90. To strengthen their emergency health workforces, national Governments, under the leadership of Heads of State and Government, should:

- Define emergency workforce protocols to ensure adequate protection, training, equipment, payment and occupational safety
- Constitute an emergency workforce by training all public and private health workers in emergency protocols

B. Building an effective health workforce

91. The Panel notes that in many developing countries the lack of trained health workers is one of the key obstacles to implementing a functioning surveillance and outbreak response system at the community level.

92. In 2013, the public health-care system of Guinea counted one doctor for every 10,000 inhabitants nationwide. In Liberia and Sierra Leone, this doctor/inhabitant ratio was lower still, with 0.2 and 0.1 doctors per 10,000 persons, respectively. It should be noted that many of these doctors are concentrated in capitals and cities, leaving smaller communities and rural areas without adequate access to health services. The ratios in all three countries are far below the minimum standard — at least 23 doctors, nurses or midwives per 10,000 people — recommended by WHO.[5]

93. Improving the effective monitoring and surveillance of new disease outbreaks will require a public health workforce capable of carrying out these functions. To achieve broad geographical coverage of the surveillance network, basic monitoring of disease must occur at the community level, including in rural areas. In this context, the Panel feels that the increased deployment of community health workers can make a significant contribution to strengthening surveillance. While such workers do not usually have formal medical qualifications, they can be provided with basic surveillance training that will allow them to identify unusual health events in their communities, and report them to the nearest health centre. Qualified medical staff can then investigate reported cases. Against this backdrop, the Panel strongly supports initiatives that scale up the deployment of community health workers. Ensuring the basic coverage of each community by health workers also contributes to the strengthening of broader health systems, to preventive health care, and makes advances towards the achievement of universal health coverage.

Recommendation 2
Governments increase investment in the training of health professionals and establish community health worker systems that are appropriate to country circumstances,

- National Governments and partners fully fund the training of community health workers
- Incentive packages are employed to help to ensure that health workers are strategically deployed in poor and remote areas
- Community health workers are recognized and integrated as a labour category with important roles in prevention, surveillance and response

[5] The WHO *World Health Report 2006* found that countries with a health-care worker density lower than 2.28 (±0.26) doctors, nurses and physicians failed to meet a target of 80 per cent skilled birth attendance.

94. Ultimately, every public health surveillance and response system relies on the wider health system. In West Africa, the few medical staff available during the Ebola crisis had to work with limited training in communicable disease epidemiology and with almost no medical equipment. Infection Prevention and Control was undermined by shortages of basic equipment such as plastic buckets and disinfectant. In rural areas, basic medications were hard to find and usually too costly for patients to afford. This challenge was exacerbated by broader health infrastructure problems. For instance, Liberia had only a limited number of ambulances, most of which were located in the capital, Monrovia. In the early days of the outbreak, many symptomatic patients were transported by taxi or carried by family members, which posed a significant risk of infection spread. The lack of laboratory and isolation facilities meant that the sick and the healthy often were co-located in holding centres, which further increased disease transmission. Weak public infrastructure, particularly in rural areas, also hampered effective national responses. Therefore, the Panel recognizes that the achievement of more robust systems to prevent and respond to health crises will require the strengthening of broader health systems in developing countries.

C. Addressing governance challenges

95. The Ebola crisis showed that once an outbreak is detected, Governments are often reluctant to declare it publicly. Fearful of the political and economic costs that can follow a public declaration of a disease outbreak, Governments have strong incentives to play down the threat. Some representatives of NGOs reported to the Panel that government officials had called them alarmist in the early months of the Ebola outbreak, arguing that NGOs were exaggerating the threat in order to raise donor funding. In one country, the decision to report only laboratory-confirmed cases despite indications of a far greater number of suspected infections contributed to an underestimation of the disease spread. This was in contrast to other countries, which reported both suspected and confirmed cases. Efforts to delay notification and play down the extent of the disease reflected the confusion and fear that can often affect political decision-making. The Panel further heard that some of the Governments of the affected countries initially requested that WHO provide assistance without publicly declaring a PHEIC. In contrast, Nigeria, Senegal and Mali took immediate action in declaring an emergency and establishing effective containment measures as soon as a case was diagnosed. Strong, proactive political action driving preparedness and response — even when a health system has limited capacity — can prevent the escalation of an outbreak and save lives.

96. Challenges related to governance and coordination also hampered key aspects of the Ebola outbreak response. The Panel's consultations with national and international responders showed that, in the early days of the crisis, there was a lack of clarity over which entities within a national administration were in charge of coordinating the response and which organizations should attend relevant meetings. In isolated cases, decision-making was slowed by interdepartmental rivalries and unclear reporting lines between the Ministry of Health, the National Ebola Coordinator and structures created by international partners. In some instances, existing national disaster response structures were not used and new structures were designed instead. In all three affected countries, the overall coordination of the

response was reassigned at least once. Furthermore, it took several months for coordination structures at the capital level to be replicated nationwide.

97. However, the Panel also heard repeatedly from all concerned that the coordination and effectiveness of the response improved significantly as soon as there was strong political commitment and direct leadership from the Head of State of each affected country.

98. There is a need to ensure that, in line with the IHR guidelines, once an outbreak is detected it is rapidly notified to WHO without political interference. It is also critical that effective crisis management structures be established quickly to address the crisis. To ensure greater transparency and make it more difficult to conceal information on an outbreak, the Panel recommends that planning for health crises as well as regular surveillance be carried out as part of the national disaster risk reduction, preparedness and response mechanisms — with input from representatives from different ministries and NGOs.

D. Strengthening community engagement

99. Community engagement is crucial in a health crisis response. The Panel found that the initial response to the Ebola outbreak did not adequately take into account the local cultural context in each affected country and that early efforts to sensitize communities were largely ineffective. While WHO and other responding institutions deployed community engagement specialists and social scientists from the beginning of the outbreak, the initial underestimation of the scale of the epidemic meant that early efforts to understand communities and engage with local populations and community leaders were insufficient.

100. Moreover, community sensitization efforts were frequently one-sided, conveying messages rather than acknowledging the legitimacy of local concerns and engaging with local populations to address them. Responders often interacted with a narrow subset of local interlocutors — in particular, local government officials — thereby neglecting to engage with the full spectrum of local society, including traditional leaders, religious leaders, women, youth and other members of the community. These challenges were exacerbated by a lack of trust between local communities and the central Government and foreigners, which in turn hindered behaviour change programmes carried out by government representatives or international actors. The situation led to the emergence of so-called community resistance, in which some communities passively, actively and, in a few cases, violently sought to avoid cooperating with health workers.

101. Public communication was also initially ineffective or, in many cases, even counterproductive. For example, early public communication sought to generate behavioural change by emphasizing Ebola's high fatality rates and the absence of a cure. Rather than encouraging the infected to come forward, this messaging drove many suspected cases to avoid testing, and led families to hide their sick. Rumours and misinformation concerning prevention and response mechanisms abounded, which public communication mechanisms struggled to counter with accurate information.

102. As case numbers soared between July and October 2014, responders focused on the medical and epidemiological elements of the outbreak rather than on

strengthening community engagement. Some community-based organizations reported that in the early days of the response, it was difficult to find funding for projects that did not involve the construction of treatment centres. Also, insufficient social science research and capacity existed to help to develop sensitive response approaches, and the inadequate attention paid to monitoring and evaluating community engagement efforts made it difficult to course-correct when necessary.

103. As with the H1N1 and H5N1 outbreaks, community engagement ultimately made the difference in the most-affected countries. The Panel was repeatedly told that progress only began to be made with the advent of efforts to specifically engage traditional leaders and local civil society groups as part of community sensitization. As awareness of the challenge of community resistance increased, organizations shifted their focus towards improving their understanding of the cultural context of the crisis, reaching out to communities, gaining community buy-in and ownership, and encouraging communities to identify their priorities and concerns. The increased engagement of social scientists — particularly anthropologists, regional experts and statisticians — through several formal and informal networks, helped responders to better understand the local cultural practices and societal dynamics that were instrumental in fuelling the epidemic. These included burial practices, high levels of local population movement and a history of conflict that has resulted in a deep distrust of outsiders, including the international community, and, in some cases, representatives of the Government.

104. Public messaging also improved. For instance, instead of emphasizing the high fatality rates resulting from Ebola, new messaging encouraged early treatment to improve the chances of recovery. Nevertheless, the large number of organizations involved in the later stages of the response effort made it difficult to coordinate messages, techniques and approaches for public communication. This in turn led to a proliferation of messages, some of which were more effective than others.

105. The Panel therefore is of the view that national and international responders should develop mechanisms to engage local communities systematically in crisis preparedness and response measures in the future.

Recommendation 3
Governments and responders strengthen and streamline their community engagement and promote local ownership and trust.

- National authorities and partners support the development and use of national social science research capacities, as well as an international network of social scientists capable of mobilizing in a crisis
- Principles of effective community engagement are featured in all training programmes for national and international responders
- National authorities and partners draw on the potential for South-South cooperation in this field
- Communication strategies are developed, with due consideration given to the cultural context

E. Training the military for health and humanitarian missions

106. As seen in the Ebola epidemic, military and other security forces have an important potential role to play as a measure of last resort in responding to health crises. In addition to the deployments of a large contingent of United States armed forces and smaller groups of United Kingdom and French forces, domestic militaries also played key roles in the response in Liberia and Sierra Leone. In the light of challenges faced by national Ministries of Health, the Governments of the two countries called upon their militaries to support health and humanitarian response personnel. In Sierra Leone, the armed forces also helped to lead the health crisis response after the Minister of Defence was appointed as the National Ebola Response Coordinator in August 2014. The experience of the involvement of the military in Liberia and Sierra Leone provided clear lessons for responding to health crises in the future. Maximizing the effectiveness of security forces in health and humanitarian deployments requires training, dissemination of human rights standards and regular simulation exercises. In addition, both military and civilian actors must work together to improve civil-military understanding and increase preparedness.

107. One key use of military and other security forces was to enforce quarantines. Separating populations according to the presumption of disease exposure and potential illness and infectivity is an important public health tool, especially in the absence of preventive vaccines and medical therapeutics. Such limitations of liberty, however, must be provided within a context of transparency and equity, and with appropriate medical and social support mechanisms. Yet the Panel found that, in the absence of adequate training in human rights, the use of militarized responses during the Ebola crisis in 2014 — including quarantines enforced by the military — did not always build confidence, and in fact undermined the response at certain points, particularly following quarantine-related clashes between the Liberian military and civilians in the West Point area of Monrovia, which led to one death. Moreover, the legacy of conflict in the most-affected countries has left populations with deep-seated fears about security forces, undermining their effectiveness in some cases.

F. Ensuring the continuation of essential health services

108. Some responders noted that the exclusive focus on the Ebola response led to the suspension of many essential social services, including vaccination drives. In Liberia, for example, routine immunizations against measles were suspended during the Ebola outbreak, putting the lives of thousands of children at risk should a new measles outbreak occur. The dedication of most health resources to fighting Ebola also affected the delivery of other health services, particularly treatments for malaria and diarrhoeal diseases. A study in Guinea found that the Ebola epidemic was estimated to have resulted in 70,000 malaria cases nationwide going untreated in 2014. In addition, pre- and post-natal services for women were largely suspended, leading to many reports of pregnant women being turned away from health-care facilities. According to some reports, the death toll from other health impacts of Ebola is likely to be larger than the death toll from the epidemic itself. In this context, it is critical to ensure that populations continue to have access to safe basic health care during an outbreak.

G. Addressing the gender aspects of health crises

109. Experience has consistently shown, including in the Ebola epidemic of 2014, that health crises have particular and important effects along gender lines that can significantly impact preparedness and response. Understanding and paying attention to the potential impacts of an outbreak with respect to gender is critical to responding effectively.

110. Throughout the crisis, women were more likely to be exposed to the virus through caregiving and burial practices, whereas men were more likely to be exposed through formal roles in the response. In addition, pregnant women who become infected with Ebola run a much higher risk of dying from the disease, and should they survive, almost always lose the unborn child. While data on gender, age and other key population characteristics were gathered by primary responders at the local level, this critical information was often not passed upward to the national or international level until much later, if at all. As a result, responders were not able to identify patterns of infection or to develop strategies to respond to them. These shortcomings reemphasize the need for the development of data technology platforms that enable real-time tracking of statistics and exchanges of information.

111. Women were also more likely to be affected by the broader socioeconomic impacts of Ebola. In the most-affected countries, women were more likely to be employed in the informal sector, which was significantly affected by closures of markets and other public spaces. The closure of schools during the 2014 Ebola crisis left women with the added responsibility of caring for children. In addition, the negative economic impacts of the crisis placed women at greater risk of sexual exploitation, owing to the diminishment of their previous income-generating strategies. Also, as noted previously, the devotion of already minimal health resources towards tackling Ebola undermined health services for other critical health priorities, including pre- and post-natal care, childbirth and childhood immunizations.

112. Any response to these challenges during the 2014 Ebola crisis was made more difficult by the underrepresentation of women at all levels of the national and international response, which reduced the input of women into the decision-making process. At the local level, only a small number of women were hired as contact tracers or community engagement specialists, and even fewer were involved at higher levels of the response. Community engagement teams also interacted with women less often than with men, since their primary interlocutors were formal gatekeepers, such as traditional leaders and local government officials, who are likely to be men. The gender integration of local-level response teams, including contact tracers and community engagement officers, could help to ensure that women are better informed and engaged.

Recommendation 4
Outbreak preparedness and response efforts should take into account and address the gender dimension.

- Since women tend to act as primary care-givers, specific attention should be given to their needs
- Efforts to address the economic and livelihood impact of pandemics pay particular attention to the situation of women

- Women must be included at all levels of planning and operations to ensure the effectiveness and appropriateness of a response

III. Regional and subregional levels

113. Several regional and subregional organizations took action to support the response to the Ebola outbreak in 2014. Most prominently, on 19 August 2014, the African Union Peace and Security Council authorized the deployment of an African Union-led military-civil humanitarian mission comprising medical doctors, nurses and other medical and paramedical personnel. From December 2014 until May 2015, the efforts of the African Union Support to the Ebola Outbreak in West Africa supported the deployment of 720 qualified volunteers from 12 African Union member States. Doctors and responders who had worked on previous Ebola outbreaks brought valuable experience. The African Union also convened a series of political meetings to highlight the need for assistance, advocate for a lift of travel bans and restrictions and request that the African Union Commission establish an African centre for disease control and prevention. The African Union further organized an African business round table with the private sector — at which $32 million was raised from the private business and the African Development Bank — and worked with mobile phone operators to channel private donations by short message service. The Bank also provided more than $223 million by December 2014 to support emergency operations in the three Ebola-affected countries.

114. The Economic Community of West African States (ECOWAS) deployed a further 115 medical staff and other responders to assist the affected countries. In addition, ECOWAS convened the Extraordinary Summit on Ebola and set up the ECOWAS Solidarity Fund for Ebola that raised more than $7 million in contributions. Furthermore, the West African Health Organization and the ECOWAS Commission trained and sensitized health officers on infection prevention and control.

115. The Mano River Union organized regular summit meetings among the Heads of State of its four member nations (Côte d'Ivoire, Guinea, Liberia and Sierra Leone) to discuss greater collaboration in the Ebola response. The Mano River Union also provided the framework for the regional recovery plan for the three affected countries that was presented at the International Ebola Recovery Conference in New York in early July 2015.

116. While the support provided by regional and subregional organizations represented a significant strengthening of their engagement and operational capacities in the health sector, the assistance nonetheless took a long time to arrive, and was not always well coordinated. The Ebola outbreak therefore highlighted the need to strengthen regional collaboration in public health. While the primary responsibility for disease surveillance and outbreak detection and response lies at the national level, cooperation at the regional or subregional levels offers significant value added in several areas.

117. A regional perspective allows for a more comprehensive analysis of regional dynamics, including population movement patterns, trends in disease hotspots and response needs. This perspective can help to inform decisions about the most efficient allocation of response assets across countries. For example, the creation of

UNMEER as a regional mission allowed for the cross-border allocation of funding and response assets to take place.

118. Regional cooperation can help to sustain improved cross-border surveillance, case monitoring and contact tracing by ensuring the regular exchange of information among public health officials on both sides of a border. The Panel heard that early on in the Ebola outbreak, cross-border information-sharing was inadequate. Regional cooperation can also lower the cost of surveillance measures at borders or reduce the need for such measures through the establishment of regional border surveillance protocols and standards.

119. Regional or subregional groups of countries may also share key preparedness or response assets, such as laboratories, medical research and development efforts, or medical evacuation facilities for crisis responders. Whereas the significant cost of these assets may render them difficult to sustain in one country, their establishment on a cost-sharing basis at the regional or subregional levels may make them feasible for all participating countries.

120. Furthermore, regional organizations can play an important role in the provision of response expertise and tools that are adapted to local conditions.

121. These advantages are also leveraged by regional organizations in other contexts. In Asia, the Association of Southeast Asian Nations has played an important role in regional responses to HIV/AIDS, SARS and H5N1 influenza, including by jointly negotiating with pharmaceutical companies to reduce the price of HIV drugs. Efforts in Europe have focused on the value of shared assets, with the European Union establishing the European Centre for Disease Prevention and Control to analyse surveillance data, advise, provide training, support preparedness and deploy expert field missions in case of an outbreak. Following the Ebola outbreak, the European Union and its member States are also creating joint response capacities by assembling a pool of medical and logistical experts with crisis experience. In Latin America, both the Union of South American Nations and the Members of the Common Market of the South have demonstrated the value of technical and operational assistance that regional organizations can provide to their members in addressing public health threats.

122. Against this backdrop, the Panel is of the view that regional organizations should develop or strengthen standing capacities to assist in the prevention of and response to health crises, with a particular emphasis on areas where they can offer significant value-added to national responses.

Recommendation 5

Regional and subregional organizations develop or strengthen standing capacities to monitor, prevent and respond to health crises, supported by WHO. This includes:

- Strengthening regional contingency and preparedness plans for health crisis scenarios, as well as pre-arranging emergency logistical and relevant medical licensing agreements that can be rapidly activated in the event of a health crisis
- Administering and operating shared regional disaster prevention and emergency response capacities, including advanced biosafety laboratories
- Enhancing regional research capacity and collaboration

- Maintaining a roster of medical experts and response staff for rapid regional deployment
- Facilitating the sharing of experiences and lessons learned among regional partners
- Maintaining, with WHO support, a commonly agreed list of pathogens posing a risk of health crises in the region
- Establishing a regional IHR update and support mechanism to strengthen compliance within the region
- Facilitating regional and subregional simulation exercises for health crisis responses, especially in border areas

IV. International level

123. The Ebola outbreak in 2014 highlighted critical weaknesses in the international system for identifying and responding to health crises caused by communicable diseases. To date, only a minority of countries have put in place the core capacities prescribed by IHR to ensure the monitoring and early warning of new disease outbreaks. The IHR review mechanism is insufficient and international resources to support the achievement of the core capacities are inadequate. This capacity deficit renders the world more vulnerable to outbreaks. However, even after the Ebola outbreak was identified and made public, the global response was too slow and suffered from important challenges with regard to financial and human resources and coordination.

124. Against this backdrop, the Panel notes that urgent measures are needed to enhance global capacity to detect rapidly and respond to health crises. These include the establishment of a new review mechanism for compliance with the IHR core capacity requirements, the reinforcement of the operational capacities of WHO, and the strengthening of United Nations system-wide coherence in responding to health crises.

A. Strengthening the World Health Organization periodic review mechanism for compliance with the International Health Regulations core capacities

125. The International Health Regulations are the framework defining the core capacities needed for the effective prevention, preparedness, surveillance and detection of communicable disease outbreaks. While there are several reasons for the high levels of non-compliance with these requirements among States parties — including a lack of financial and technical capacity and the prioritization of competing health issues — the IHR mechanism for monitoring and ensuring compliance is weak. These weaknesses are evident in three main ways. First, reporting on the compliance is based solely on self-assessment by State parties and IHR currently do not include an adequate mechanism for reviewing compliance reports. Secondly, IHR do not provide for financial assistance or other support for the implementation of the core capacities. Thirdly, there are no sanctions for non-compliance.

126. The IHR legal agreement is further weakened by its relative obscurity among many health and development officials. In the course of its deliberations, the Panel learned that several Heads of State or Government were unaware of the existence and obligations of IHR. Similarly, the IHR requirements are not always integrated into health programming by national Governments, partners, or even WHO.

127. In this context, it is notable that compliance with the relevant quality standards of the World Organization for Animal Health in the area of veterinary services is monitored through a process of independent and external evaluations. The standard of compliance review for veterinary services is therefore significantly more rigorous than that for human health. This is unacceptable.

128. In the view of the Panel, compliance with the IHR core capacity requirements is too important to rely entirely on a system of self-reporting. A more objective review process is required. The Panel therefore recommends the establishment of a periodic review mechanism on compliance with the IHR core capacity requirements within the World Health Assembly (or within a specially created committee of the Assembly). For countries under review, annual compliance self-assessments would be complemented by an assessment arranged by the WHO secretariat. Both assessment reports would then be discussed at the World Health Assembly (or by its designated committee), where other States parties would be given the opportunity to comment. This process would result in a costed action plan to address any identified compliance gaps.

129. The goal of the review mechanism should not be to impose sanctions, but instead to promote awareness and achieve compliance. Given that the world's poorest countries are the most vulnerable to a disease outbreak, the development of effective surveillance capacities in these countries is a particular priority. However, the Panel is of the view that it is unreasonable to require countries with extremely limited resources to implement rigorous and costly surveillance and early detection systems without financial and/or technical assistance, and that past efforts to do so have proven unsuccessful.

130. To better incentivize participation by all States parties in the periodic review, reviews should be tied to guarantees of financial and technical assistance to address gaps identified in the costed action plan, when required (see recommendation 23).

131. A concerted effort by national Governments and their partners to strengthen IHR core capacities, assisted through a review process, could achieve full compliance with the IHR core capacity requirements by 2020.

132. There is a close relationship between compliance with the IHR core capacity requirements and the wider improvement of health systems. The Panel recommends that once a country has achieved its IHR core capacities, the review process should broaden its focus — on the basis of WHO guidance — to enhancing the functionality of health systems as a whole.

Recommendation 6
WHO strengthens its periodic review of compliance with the IHR core capacity requirements.

- States parties, in consultation with non-State actors, provide the WHO secretariat with an annual written assessment of their state of implementation of the IHR core capacities

- On a rotating basis, each country is subject to a periodic review, with all States parties to IHR reviewed over a four-year period
- For countries under review, WHO arranges an independent field-based assessment of compliance with the IHR core capacity requirements, and, where available, coordinates with other reviews
- Both a country's self-assessment and the WHO-arranged assessment are presented to the World Health Assembly (or a committee created by the Assembly) for discussion
- At the review, a senior representative of the country is invited to comment on both reports. Other members of the World Health Assembly also have an opportunity to comment
- Within three months of the meeting, the WHO secretariat develops a costed action plan for each country on the basis of the discussions, using the WHO costing tool
- On the basis of the review, the WHO secretariat consolidates a public report on the global state of implementation of the IHR core capacities, and outlines an implementation strategy with requirements for international assistance
- Once a State party has achieved full compliance with the IHR core capacity requirements, the periodic review process broadens to a wider assessment of a country's health system, on the basis of guidance to be developed by WHO. This assessment includes revisiting compliance with IHR core capacities

B. Strengthening the operational capacities of the World Health Organization

133. The Panel's investigations, as well as those of the Ebola Interim Assessment Panel and other review efforts, have found that there was a significant delay in the response to the Ebola outbreak as well as in the announcement of a PHEIC. WHO initially failed to recognize the scale of the outbreak and the risks it posed for further spread. In spite of multiple alerts, including from Médecins sans frontières, WHO continued to downplay the threat, and its declaration of a PHEIC was late. The Panel is of the view that a significant strengthening of the WHO response capacity is urgently needed.

134. The Panel's hearings revealed that a confluence of several factors contributed to the insufficient response by WHO to the early stages of the Ebola outbreak, and the delayed declaration of a PHEIC.

135. First, a lack of reliable data led WHO and others to underestimate the scale of the outbreak. WHO did not adequately take into account the fact that significant numbers of initial cases of Ebola virus disease went unreported and that the early response efforts were highly insufficient. For example, in mid-April 2014, authorities were reportedly monitoring only 67 of the 390 people in Guinea who were known at the time to have been in contact with an Ebola-infected person. Moreover, at that time, the definition of contact was overly restrictive, often covering only immediate family members, as opposed to a range of other possible contacts. Widespread resistance to community engagement and response efforts — as well as the decision by one affected country to report only laboratory-confirmed

cases — further prevented the development of an accurate understanding of the true scale of the emergency. Responders incorrectly assumed that the outbreak would "burn itself out" within a few weeks, on the basis of experiences with past outbreaks, all of which had been contained before affecting more than 400 people. This assumption contributed to a degree of complacency by WHO and other responders.

136. Secondly, the emergency response capacities of WHO were further impeded by recent budget cuts. WHO emergency response activities are exclusively dependent upon voluntary funding. Following the global financial crisis, voluntary contributions to WHO were cut by $500 million. This was further compounded by the impact of the exchange rates, as the organization's mainly United States dollar-based resources had lost a third of their purchasing power since 2006. The organization's preparedness, surveillance and outbreak response capacity was particularly affected by these cuts, with expenditure falling by more than 50 per cent (from $469 million in 2012/2013 to $228 million in 2014/2015), and significant staffing cuts at headquarters and in the Regional Office for Africa, which covers the Ebola-affected countries. The WHO Regional Director for Africa informed the Panel that the overall budget allocation for the Regional Office had been cut from $26 million in 2010/2011 to $11 million in 2014/2015. As a result, the Regional Office had to reduce the number of its trained emergency response specialists from 12 to 3.

137. Thirdly, the longstanding culture of WHO is that of a technical organization mandated to set international standards and assist in their implementation. WHO does not have a culture of emergency response. Even during the Ebola outbreak, the work of WHO often focused on monitoring epidemiological data and on advising ministries of health.

138. Fourthly, the complex governance structure of WHO creates confusion as to which unit has the lead in the emergency response. For outbreaks classified in the WHO Emergency Response Framework as a Grade 2 emergency or above, the organization's relevant Regional Office is in charge of a response, with headquarters supporting the effort by sending experts and other measures. In the early period of the Ebola response, there was, at times, a lack of clarity over who was in charge of determining team leadership and the composition and pattern of deployment. More broadly, the Panel heard that the WHO management structure — in which Regional Directors are not directly appointed by the Director-General — can undermine the ability of the Director-General to command strategy and control the actions of all WHO secretariat staff. The Panel was informed that there are no general terms of reference that apply to the WHO Regional Directors. There is an important need to streamline WHO along the lines of other international agencies to ensure that the executive head has a clear line of direct authority throughout the organization. Such streamlining cannot be effectively achieved without the Director-General having direct control over the budget and personnel of the WHO secretariat.

139. Fifthly, WHO was sensitive to the concerns of Governments regarding the possible adverse economic effects resulting from the declaration of an outbreak. While IHR requires that there be consultations between WHO and an affected country before the declaration of a PHEIC, there is no requirement that an affected country consent to a PHEIC declaration. The reluctance of the Governments of the Ebola-affected countries to accept that the outbreak constituted a PHEIC was an

important factor in the decision by WHO to delay the establishment of an emergency committee and the declaration of a PHEIC. Reports indicate that internal communications prepared for the Director-General by senior WHO officials warned that invoking IHR by declaring a PHEIC "could be seen as a hostile act in the current context and may hamper collaboration between WHO and the affected countries".

140. Some other political considerations may also have informed the decision to delay. In 2009, WHO received sharp criticism for declaring the influenza pandemic of 2009 a PHEIC on the basis of early information about its pathogenicity, because eventually it transpired that the virus was not highly pathogenic for the majority of population groups. Furthermore, in early 2014, WHO was already engaged in fighting a number of outbreaks and emergencies that were stretching its financial and human resources. These included a MERS outbreak in Saudi Arabia, a new avian influenza A strain in China, polio in war-torn Syrian Arab Republic and a number of conflict-related health issues in the Central African Republic and South Sudan. Given the consequences of its delayed Ebola response, there is a need to improve the balance between the sensitivity of WHO to the concerns of its member States and its obligations as the global public health authority. With stronger leadership from the Director-General, a PHEIC could have been announced earlier.

141. As a result of the factors above, the initial response was inadequate, and the declaration of a PHEIC was delayed until 8 August 2014, by which time more than 1,600 persons had been infected.

142. However, even after the declaration of the PHEIC and heightened international recognition of the scale of the problem, the international response was hampered by coordination and operational problems.

143. First, despite significant commitments following the declaration of the PHEIC and the resultant global media attention, international aid was slow to arrive. And while significant financial support had been pledged, it often took weeks for funds to be committed and disbursed. The lack of clarity regarding country needs, responsibilities and reporting lines played a role in this delay.

144. Secondly, qualified medical responders were in short supply. Several first-line responders noted that the most significant constraint in the response was not funding, but personnel. There were not enough doctors with experience in fighting Ebola to man the number of Ebola treatment centres that were required in the three affected countries. Foreign medical teams, including from the African continent, played a significant role in providing qualified doctors, but most still needed training in running a treatment centre. NGOs and United Nations agencies reported that even non-medical staff were reluctant to work in Ebola-affected countries, and that some turned down assignment offers. Many responders noted that the absence of guaranteed medical evacuation was a key disincentive for staff to join the response effort in the affected countries. Similarly, the capacities of the partner institutions of the Global Outbreak Alert and Response Network — a network of public health institutes with access to experienced epidemiologists and other outbreak-response workers who can deploy for short duration in the case of an outbreak — were insufficient in meeting the demand for deployments. Even the WHO secretariat faced difficulties in deploying adequate numbers of officials to West Africa. At the time of the Ebola outbreak, WHO was already stretched by the ongoing responses to three different Level 3 humanitarian emergencies, as well as

other outbreaks. It took WHO several months to scale up its staffing efforts significantly, and many of its international staff were deployed only for short durations, which created a high turnover.

145. Thirdly, the Ebola emergency exposed the inadequate operational capacity of WHO. Even when the organization recognized the escalating response needs, its internal administrative rules on human resources, procurement and finance did not facilitate the rapid deployments of staff or emergency response materials. In terms of finance, all of the WHO emergency response activities to individual outbreaks are funded exclusively from voluntary contributions. This means that all major response activities require rapid appeals for funding. The small operational support team of the Global Outbreak Alert and Response Network at WHO was also overstretched in handling the demand for rapid deployments.

146. Fourthly, crucially needed medical materials — including personal protective equipment — for example, protective suits and gloves — and other response materials such as cars, motorcycles (for difficult roads), tents and beds — were not always easy to procure. Furthermore, unilateral border closures and trade and travel restrictions hindered the flow of response supplies to the affected countries. In the light of the suspension of flights by several commercial airlines, special humanitarian logistics networks had to be utilized. Transport challenges were more pronounced within the affected countries, where the absence of viable roads often required a reliance on helicopters. Given the highly communicable nature of the cargo, the transport of laboratory samples posed particular challenges.

147. Fifthly, response efforts lacked relevant expertise and knowledge about how an Ebola outbreak of this scale could be effectively contained. The pool of people with expertise in Ebola outbreaks was limited, and there was a lack of standards and guidelines for distribution to health centres and responders. Even countries with advanced health systems did not have correct Infection Prevention and Control protocols in place to protect against Ebola. Furthermore, the scale of the outbreak presented an additional challenge. It was unclear how best to plan an operational response to an outbreak that had already spread to three countries and was continuing to expand. As treatment centres and laboratories took weeks to build or procure, planning needed to be made based on projections of future disease spread, and regularly adjusted in line with new developments. In late September 2014, a study by the United States Centers for Disease Control and Prevention predicted that there would be more than 1.4 million Ebola cases in the three affected countries by January 2015. However, behavioural change among communities combined with the effective medical response measures prevented the disease from reaching the proportions projected initially.

148. Against this backdrop, the Panel recommends a significant strengthening of the WHO operational emergency response capacities. The WHO secretariat must be empowered and resourced to fulfil the leadership role bestowed upon it by member States. As stated in the Constitution of the World Health Organization, the purpose of the organization is:

> To act as the directing and coordinating authority on international health work, ... to establish and maintain effective collaboration with the United Nations, specialized agencies, governmental health administrations, professional groups and such other agencies as deemed appropriate. To assist Governments, upon request, in strengthening health services and to furnish

appropriate technical assistance and, in emergencies, necessary aid upon the request or acceptance of Governments.

149. In the case of a communicable disease outbreak, the world looks to WHO to lead the global response. However, to date, the organization has not developed the operational capacities required to meet this expectation. As outlined above, this is attributable in part to its organizational culture, having served historically as a normative organization. In addition, WHO has received inadequate support by member States.

150. The Panel takes note of the reform efforts carried out by the Director-General of WHO since the WHO Executive Board session of January 2015. These reform efforts included the creation of the Programme on Outbreaks and Emergency Management, under the leadership of an Executive Director at the Deputy Director-General level. While the Panel welcomes these efforts, it emphasizes the need for the operational capacities of WHO to be unified under a single reporting, command and control structure. In this context, the proposal by the WHO Ebola Interim Assessment Panel for the creation of a "centre" corresponds more closely to what is needed than the WHO programme. Therefore the Panel recommends the creation of a "centre for emergency preparedness and response".

151. The WHO centre for emergency preparedness and response should include a global surveillance mechanism as well as an open data platform that collects information on unusual health events through both a formal notification process and from other sources. This information should be publicly available.

152. The centre should establish significant operational capabilities. These must include rapidly deployable human resource assets — including medical personnel and other responders — to respond to health crises. Existing mechanisms such as the Global Outbreak Alert and Response Network and foreign medical teams should also be expanded and strengthened. In this context, the Panel welcomes the initiative by the Director-General to create a "global health workforce" and urges its rapid implementation. The staff identified should receive basic training in emergency response and Infection Prevention and Control so as to be rapidly deployable with only minimal need for additional disease-specific training. To facilitate rapid deployment, the centre should develop mechanisms for guaranteed medical evacuation for all deployed staff. The centre should further develop streamlined administrative procedures to enable emergency response operations.

153. Similarly, the centre should identify and stockpile (as appropriate) core emergency response materials in strategic locations, and develop partnerships with logistics providers so as to be able to support the rapid deployment of responders and crucially needed materials.

154. The centre should also develop operational response plans and protocols for health crises and lead the overall health response effort through the Health Cluster. In situations where a health crisis is the root cause of a broader humanitarian emergency, the centre should play a lead role in the coordination of an inclusive inter-agency response (see recommendation 8).

155. The core task of the centre should be the early identification of communicable disease outbreaks and — in partnership with the Governments of affected countries — the leadership of a rapid operational response, so that outbreaks do not escalate to a PHEIC. The WHO member States and partners should bolster this

effort by supporting the WHO emergency response even before an outbreak develops into a PHEIC. The centre must be adequately staffed and resourced, and should be funded from assessed contributions. To guarantee quick access to resources to support a response, the centre should have access to, and the ability to administer, the organization's newly created Contingency Fund for Emergencies. However, the Fund's resources should also be available to other health responders. The centre should also have access to the World Bank pandemic emergency financing facility, if triggered.

156. The centre should also be tasked to determine if an outbreak necessitates accelerated research and development on medical countermeasures such as diagnostics, therapeutics or vaccines, and should work closely with the relevant WHO department in coordinating measures to support such research.

157. The centre should be guided by an independent advisory board — composed of representatives of other United Nations emergency response organizations, national Governments, health NGOs and other institutional partners — so as to ensure broad input into the centre's situational assessments and to reduce misjudgements or political interference. The members of the advisory board should have access to WHO surveillance data and should provide input to the centre's assessments and response.

158. While the Panel's work was focused on emergencies driven by health crises, various interlocutors called for strengthened leadership of the Health Cluster by WHO during humanitarian emergencies, including greater inclusivity and independence in coordination. The creation of the centre must therefore lead to stronger, more inclusive and independent leadership of the Health Cluster.

Recommendation 7
WHO immediately strengthens its leadership and establishes a unified, effective operational capacity.

- Taking note that WHO established the Programme for Outbreaks and Emergencies Management, but in the light of the need for unified command, the Panel proposes that such a Programme become a centre for emergency preparedness and response, with command and control authority
- The centre is the central command and control mechanism in case of health emergencies. It should be adequately funded and staffed, with clear lines of authority within the organization
- A standing advisory board is established to guide the centre in its activities. The advisory board should incorporate representatives from United Nations bodies, national Governments, NGOs and institutional partners to encourage a multisectoral approach
- During a health crisis, the centre takes full authority for the Health Cluster response and liaises closely with the Government and all actors
- The centre houses a workforce deployment management unit, to include the Global Outbreak Alert and Response Network and foreign medical team programmes, which coordinates the Global Emergency Health Workforce, deploying experts and foreign medical teams, as needed

- The centre establishes a transparent protocol to activate an immediate response to outbreaks and to call on political action where obstacles delay or prevent international action
- The centre also houses an open data platform that will collect, manage and analyse public data on epidemiological events globally. The centre will be responsible for making this data publicly available in real time
- The centre manages the proposed WHO contingency fund and has access to the pandemic emergency financing facility
- The centre collaborates closely with the WHO Health Systems and Innovation Department with regard to research and development in health crises
- The centre, in collaboration with IASC, establishes standard operating procedures for humanitarian actors operating in health crises

C. Enhancing United Nations system-wide coordination in the global response to health crises

159. Beyond the WHO response, the Ebola crisis also exposed a lack of coherence and coordination in the wider United Nations system.

160. First, there was no established inter-agency mechanism for responding to health crises with multidimensional impacts. The IASC cluster system, coordinated by the United Nations Office for the Coordination of Humanitarian Affairs, is usually activated to respond to large-scale humanitarian crises. In the case of the Ebola crisis in 2014, the IASC mechanism was considered but in the end not selected for several reasons. These included the fact that the Ebola outbreak was initially seen as a health rather than a humanitarian crisis, a belief compounded by the decision by WHO to not raise the issue with the IASC Principals (agency heads) at an earlier stage. Also, the numbers of those infected in the early days of the Ebola crisis were relatively small compared with the caseloads in other humanitarian crises.

161. The WHO Director-General first briefed IASC on the Ebola crisis at a meeting in August 2014. The IASC Principals felt that WHO, as the lead agency for health, should take the lead in responding to the crisis. There was no decision to activate a broader humanitarian response level. However, the slow response by WHO — including its slow deployment of staff — prompted questions about its ability to provide the required leadership. Furthermore, as the crisis unfolded, it became clear that it included several other dimensions besides health — such as Water, Sanitation and Hygiene for All (WASH), education and food security — and that WHO alone would therefore not be able to coordinate the overall response. IASC members — and others — also concluded that given the rate at which the epidemic was evolving, a string response system with leadership able to provide direct command and control should be established. This is significantly different from the IASC cluster system.

162. Amidst delays in the response, and with the spread of the outbreak rapidly outpacing efforts to contain it, it was recognized that a rapid scale-up of the response was needed. Following consultation with the Director-General of WHO, on 17 September 2014, the Secretary-General announced his intention to immediately

establish the United Nations Mission for Ebola Emergency Response (UNMEER), the first ever United Nations health emergency mission. The proposal to establish UNMEER was welcomed by the General Assembly in its resolution 69/1, on 19 September 2014.

163. In its consultations, the Panel learned that, the establishment of UNMEER, under the personal leadership of the Secretary-General, played an important role in raising worldwide attention on the Ebola crisis and supported Governments, United Nations agencies and other actors to galvanize their response into emergency mode. While most of the United Nations operational response continued to be implemented by lead agencies, including the International Federation of Red Cross and Red Crescent Societies, the United Nations Development Programme (UNDP), the United Nations Children's Fund (UNICEF), WFP and WHO, UNMEER helped to establish a common operational platform for the response. In the affected countries, the UNMEER Ebola Crisis Managers were credited for convening actors and partners at the country level, engaging politically and ensuring a nationally owned and inclusive approach. UNMEER also brought a much needed and called-for regional perspective to the response. This allowed the Mission to support the redeployment of response assets across national borders. Furthermore, the logistical support provided by WFP under the coordination of UNMEER was seen as a critical multiplier for the response.

164. However, the Panel also heard criticisms of UNMEER. Several responders noted that it took a long time for the Mission to become fully operational and assume its coordination role. In particular, UNMEER struggled to deploy sufficient personnel with the specialist skill sets required in a timely manner. It was also noted that, by superimposing a new structure onto a response that was under way, UNMEER did not sufficiently leverage existing mechanisms, structures and expertise, whether United Nations or national. The Mission's contribution was seen as most effective when it ensured inclusion and facilitated collaborative coordination, much like an empowered humanitarian coordinator. Furthermore, some noted that the UNMEER headquarters location in Ghana and its initial lack of field presence in the affected countries undermined its ability to coordinate an effective response. Several field responders noted that they had no contact with UNMEER. However, the decision to establish a headquarters outside of the affected countries was understandable in the light of initial projections of the disease progression and the existence of flight restrictions in place in the region.

165. In the view of the Panel, the establishment by the Secretary-General of UNMEER made a valuable contribution to strengthening the global Ebola response at the height of the crisis. However, the experience of UNMEER also highlighted the challenges involved in establishing a new coordination mechanism in the midst of a crisis, and underscores the need to rely on existing or pre-agreed coordination mechanisms, such as the IASC cluster system mechanism, to deal with crises. If needed, such mechanisms should be adapted to the nature of the crises.

166. Concurrently with the establishment of UNMEER, the Secretary-General also appointed his Special Envoy on Ebola to provide strategy and policy direction to the Ebola response and to galvanize international donor support. In its consultations, the Panel heard that the Special Envoy played an important role in defining financial requirements, raising funds for the Ebola response and facilitating regular

coordination among international responders throughout the world. The appointment of the Special Envoy further helped to maintain political attention on the crisis.

167. To ensure a robust and well-coordinated system-wide response to future health crises, the Panel recommends that clear reporting lines and protocols be put in place to govern collaboration among United Nations agencies. In particular, the Panel feels that the measures set out below would ensure greater coherence.

168. Wherever possible, the IASC cluster system should be used to ensure inter-agency coordination in emergency response situations. This would include crises brought about by communicable disease outbreaks. If, as is frequently the case, a communicable disease outbreak occurs as part of a broader conflict-driven emergency or a natural disaster, the Health Cluster, under the leadership of WHO, should lead the health response, reporting to a Humanitarian Coordinator appointed by the Secretary-General.

169. However, there may be situations, such as with a possible pandemic influenza outbreak, where a health crisis is the root cause of a humanitarian emergency. Given the need for the health response to inform the overall crisis response in such situations, IASC may wish to assign overall leadership of the inter-agency response to WHO, through the cluster system. When these situations occur, the Secretary-General should appoint the Executive Director of the WHO centre as his/her Emergency Coordinator, allowing the WHO centre to oversee the direct health response as Health Cluster lead, as well as overall coordinator of the wider humanitarian response.

170. The Panel also recommends that IASC review the cluster system to strengthen its effectiveness and capacity as am emergency coordination mechanism, in particular in the context of health crises.

171. To ensure global political engagement and commitment beyond the health sector, the Panel further recommends that, in the case of health crises such as Ebola, the WHO Director-General formally and regularly report to the United Nations Secretary-General on the crisis response. This will assist the Secretary-General in using his or her good offices to support the global response efforts.

Recommendation 8

In the event of a Grade 2 or Grade 3 outbreak that is not already classified as a humanitarian emergency, a clear line of command will be activated throughout the United Nations system.

- The WHO Director-General reports to the United Nations Secretary-General on the response
- The WHO Regional Director reports directly to the Executive Director of the WHO centre to ensure the coherence of the whole system
- The Executive Director of the centre will be the Secretary-General's Emergency Coordinator, who will be tasked with leading an inter-agency response, if needed
- Given that WHO is the designated lead operational agency in a health crisis response, the Secretary-General should ensure that the IASC cluster system is fully operational in supporting the Emergency Coordinator in leading an inter-agency response, if needed

- The IASC remit, including the cluster system, is reviewed to enhance robustness, timeliness, coordination and the capacity to address health crises

172. The Ebola outbreak also exposed the fact that existing emergency categorizations in the health and humanitarian sector are incoherent and can lead to misunderstandings. For example, the WHO Pandemic Phases distinguish disease outbreaks in six phases, depending on the scope and modality of transmission. Similarly, the WHO Emergency Response Framework recognizes three grades of health emergencies and describes the allocation of the responsibilities of WHO in each case. Also for WHO, IHR allow for the declaration of a PHEIC. In the broader humanitarian system, the IASC framework for classifying humanitarian emergencies also consists of three levels, each with a different implication for response mobilization. A lack of awareness of the four systems, combined with confusing terminology, contributed to misunderstandings between the health and humanitarian sectors in the early stages of the Ebola response. Therefore, the Panel is of the view that efforts should be made to harmonize the different emergency classification systems. In particular, each health emergency classified as a Grade 2 or Grade 3 emergency according to the WHO Emergency Response Framework should automatically trigger an inter-agency assessment of potential humanitarian consequences.

Recommendation 9
The Secretary-General initiates the integration of health and humanitarian crisis trigger systems.

- With immediate effect, every health crisis classified as Grade 2 or Grade 3, according to the WHO Emergency Response Framework, automatically triggers an inter-agency multisectoral assessment

V. Cross-cutting issues

173. In addition to issues related to preparedness and response at the national, regional and international levels, the Panel has also identified a number of key cross-cutting issues that need to be addressed to strengthen the global response to health crises.

A. Development and health

174. One of the recurring themes of the present report is that the countries most affected by communicable diseases suffer from a range of capacity challenges that exceed health. In 2014, all three of the countries most affected by Ebola had recently emerged from conflict. Liberia and Sierra Leone remained fragile after more than a decade of civil war, while Guinea had experienced significant political tensions and civil strife in 2008. In addition, the 3 countries are included among the world's 48 least developed countries, along with 31 other countries in Africa, 9 in Asia, 4 in Oceania, and 1 in the Americas. The Democratic Republic of the Congo and Uganda, both of which experienced Ebola crises in the past, also rank within this group. In 2014, the annual GDP per capita in Guinea, Liberia and Sierra Leone stood at $540, $458 and $766 respectively, placing the three countries among the 20 poorest nations for which data were available. And these averages hide big

disparities in income. In Guinea, 35 per cent of the population live in absolute poverty[6] (2012). In Liberia and Sierra Leone, the proportion is 69 per cent (2007) and 52 per cent (2011), respectively.

175. In addition to low economic indicators, many of these countries also suffer from inadequate infrastructure and social services. More than 30 per cent of the rural population lack access to potable water, and 4 out of 5 people lack access to basic sanitation facilities. One third of all children under the age of 5 suffer from stunted growth as a result of undernutrition. More than 30 per cent of children do not complete primary education, and less than half of all adults are literate. As outlined previously, access to quality health care in all three countries is extremely limited. As a result of these challenges, the average life expectancy in the current birth cohort stands at 60 years in Liberia and 50 years in Sierra Leone.

176. While new and dangerous pathogens can emerge in any country in the world, poor living conditions mean that developing countries are often at particular risk of emerging communicable disease outbreaks. Urbanization and agricultural production often encroach deep into natural animal habitats, exposing populations to the risk from zoonotic diseases.

177. Once a disease has emerged, a lack of basic sanitation, weak health systems and vulnerable populations help to exacerbate its rapid spread. Basic preventive care — such as child immunizations, regular doctor visits and hygiene education — is inaccessible to much of the population, particularly in rural areas. Similarly, a lack of qualified medical personnel, basic equipment and pharmaceuticals render many otherwise treatable diseases fatal. As the Ebola outbreak in 2014 demonstrated, these conditions also increase the likelihood of transmission of infections in health facilities and hinder effective outbreak response.

178. While the challenges related to poverty render the least developed countries more vulnerable to communicable diseases, they also undermine the ability of such countries to build effective and responsive health systems. The Panel learned that in the three countries most affected by Ebola, far less than the 15 per cent of government expenditure recommended in the Abuja Declaration is allocated to health. Similarly, annual public spending on health per capita amounts to less than one fifth of the recommended minimum level for primary health care. While many countries have repeatedly committed to a range of aspirational targets related to health-care spending, to date only a small number of countries spend more than the recommended per capita minimum. The Panel urges all countries to review their spending priorities with a view to increasing national budget allocations to health towards the recommended minimum, which will also help to achieve the IHR core capacities. At the same time, many developing countries will require substantial assistance from partners to strengthen their health systems.

1. Achieving the Sustainable Development Goals

179. At the United Nations summit for the adoption of the post-2015 development agenda, the international community committed to achieving 17 Sustainable Development Goals and 169 targets, including several in the area of health (see General Assembly resolution 70/1). Specifically, Heads of State and Government committed to:

[6] Absolute poverty defined as living on less than $1.90 at 2011 prices (purchasing power parity).

- "By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases" (Goal 3.3)
- "Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks" (Goal 3.d)
- "Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all" (Goal 3.b)

In support of building health systems, the Sustainable Development Goal commitments are to:

- "Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all" (Goal 3.8)
- "Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States" (Goal 3.c)

180. Against this backdrop, the Panel urges all Member States to meet the Sustainable Development Goals, particularly in the area of health. It notes that the threat of health crises from communicable diseases has been recognized in Goal 3.3, and urges Member States to ensure that the monitoring and follow-up process of the Goals takes compliance with IHR core capacity requirements into account as a crucial element in preventing outbreaks of communicable diseases.

Recommendation 10
The international community must fulfil the commitments towards the Sustainable Development Goals, with a particular emphasis on health-sector goals.

- The Statistical Commission, in its deliberations on the indicators for the Sustainable Development Goals, should give consideration to measuring compliance with the IHR core capacity requirements and the strengthening of overall health systems as indicators towards the attainment of the health goals of the Sustainable Development Goals

2. Strengthening health systems

181. Over the past four years, international development assistance to health has remained stagnant at around $35 billion a year. However, the bulk of these funds are devoted to vertical programmes dedicated to specific health indicators. These programmes often function in parallel to the public health system and sometimes build a separate health-care infrastructure at significant cost. While such programmes can provide good results in achieving specific targets (such as

decreasing maternal and child mortality or providing antiretroviral treatments to people living with HIV), their work is limited to one area and tends to have limited spillover benefit for the broader health-care system. Furthermore, by providing better salaries and amenities, vertical health programmes often undermine broader public health systems by attracting trained staff away from positions in the public sector.

182. In this context, dedicating a greater proportion of domestic and international funding to strengthening health systems could bring broader ancillary benefits, including collecting vital health statistics (including the registration of births and deaths), enhancing vaccination campaigns, and ensuring more holistic patient follow-up. Against this backdrop, the Panel is of the view that partners should channel a greater proportion of their official development assistance (ODA) towards strengthening health systems.

183. To effectively strengthen health systems, partners should provide a greater share of aid for health through national Governments, as these are the entities best placed to coordinate the creation of national health systems. Figures for budget support are difficult to obtain, but available data show that, to date, approximately two thirds of development assistance for health programming has been allocated to vertical programmes, leaving little for Governments to allocate to national priorities. Only a reported 6 per cent has been given to strengthening health systems and promoting comprehensive cross-sector approaches. Providing a greater proportion of funding to countries through budget support would enable national Governments to direct funding to where it is most needed and to strengthen the apparatus that underpins their health-care systems. However, many partners reported to the Panel their reluctance to increase budget support owing to the perceived weaknesses of governance and financial management systems in less economically developed and vulnerable countries. At the same time, recipient countries claim that benchmarks for governance and financial management are unclear and change frequently.

184. The Panel also notes that local and international NGOs working in developing countries should align their activities with overall national plans and operate with full transparency. The Panel heard concerns from some Governments that they were not aware of some of the activities being carried out by NGOs in their countries. To ensure efficient resource allocation, partners should also hold NGOs to the highest standards of good governance and financial management.

Recommendation 11
Partners sustain their official development assistance to health and direct a greater percentage to strengthening health systems under an agreed-upon Government-led plan.

- ODA is strategically directed to an incremental, on-budget, five-year plan of health system strengthening
- Benchmarks for transparency and good governance in financial management are clear and consistent
- NGOs operate with the same level of transparency and good governance as is expected of national Governments

3. Complementing health systems with development programming

185. Even strong health systems can be undermined by wider developmental challenges. Several interlocutors identified inadequate water and sanitation, energy, communications, transportation and road networks as major obstacles to improving health services.

186. In this context, the Panel recommends greater complementarity of development efforts, with a view to supporting strengthened health systems in developing countries, particularly in rural communities, where access to health care is the most limited. For example, programmes to establish and maintain rural health centres should be supported by complementary electrification, water and sanitation projects, or by expanding infrastructure to ensure wider access to health-care services.

Recommendation 12
WHO works closely with development actors to ensure that development programming supports health systems and thereby helps to improve universal and equitable access to quality health.

B. Research and development

187. The discovery and production of new vaccines, therapeutics and diagnostics is crucial in preventing and responding to communicable disease crises. Over the past century, discoveries in medical research have achieved significant reductions in morbidity and mortality from many diseases including rabies, polio, measles and rubella, and eradicated others, including smallpox. More recently, initiatives by GAVI, the Global Fund to Fight AIDS, Tuberculosis and Malaria, WHO and UNICEF, among others, have significantly expanded access to life-saving vaccines in developing countries.

188. However, too little research and development has been devoted to addressing the numerous communicable diseases that primarily affect developing countries and could spark a health crisis. WHO maintains a list of 18 neglected tropical diseases that are endemic in 149 countries and affect more than 1.4 billion people. The Ebola outbreak in West Africa in 2014 was another example of the consequences of the spending gap for research and development. Ebola has been known for 40 years and there have been more than 20 outbreaks since its discovery. Yet in 2014, no Ebola vaccine was available for use in containing the epidemic.

189. The lack of research and development for diseases that largely affect the poor is the result of market mechanisms. Developing new pharmaceutical products requires high levels of investment and involves numerous unsuccessful trials. Guided largely by the need to recoup the costs of research and the opportunity for commercial gain, pharmaceutical companies focus their efforts on diseases that primarily afflict societies whose health-care systems and citizens are willing and able to pay for new products. As a result, of the $214 billion invested in health research and development in 2010, less than 2 per cent was allocated to neglected diseases, and since that time the allocation has actually dropped further.

190. When the Ebola outbreak in West Africa gained international attention, significant funding was made available to research institutions to accelerate work on

a vaccine.[7] Had these vaccines been available prior to the outbreak, many more lives could have been saved.

191. Measures are urgently needed to expand the research, development and production of life-saving medical products for neglected diseases, with a particular focus on the communicable diseases that pose a high threat of causing health crises. Where possible, medical countermeasures (including vaccines, therapeutics and diagnostics) should be developed to the stage where they can be rapidly tested and produced in the event of an outbreak. In order to achieve this, the issues described below must be addressed.

1. Establishing better incentives for research and development relating to neglected diseases

192. First, there is a need to better incentivize research and development on neglected communicable diseases and other dangerous pathogens. Since the market does not provide adequate incentives, public policy intervention is required to ensure that greater resources are focused on these pathogens. A range of economic policy instruments can help to achieve this, with varying levels of efficiency and effectiveness. These include direct public or private grants, tax breaks for organizations undertaking research and development, prizes for the successful achievement of research goals, advance market commitments, or the subsidization of basic research efforts.

193. There are also a number of regulatory incentive mechanisms that could be considered. For example, in December 2014, the United States Congress passed the Ebola Treatments Bill, which added Ebola to the priority review voucher programme of the Food and Drug Administration. This provides developers of a vaccine for a qualifying neglected tropical disease with a voucher that grants Food and Drug Administration priority review status for any other product under development.

194. The best combination of different financial or regulatory incentive measures to be used will differ by pathogen, as well as a number of other factors. However, all will ultimately require public funding. The Panel therefore strongly supports the creation of a dedicated research and development fund overseen by WHO (see recommendation 22 in the section on finance and economic measures below).

2. Prioritizing research efforts on communicable pathogens

195. While there are a number of underresearched pathogens posing a threat to humanity, it is not clear which of them will lead to the next outbreak and should therefore be the subject of priority research. To date, different countries and agencies have created their own priority lists, but a unified risk-adjusted priority list does not yet exist. However, national lists focus on national priorities and potentially deprioritize the diseases most likely to present a significant international threat. Moreover, significant trade-offs are involved in vaccine research. The Panel heard from a representative of the pharmaceutical industry that, in order to produce adequate amounts of an experimental Ebola vaccine for clinical trials, the company

[7] Because of these efforts, an experimental vaccine was reported to have shown positive results in clinical trials in Guinea on 31 July 2015. Several other vaccines were also tested in clinical trials.

had to suspend its production of a vaccine against rotavirus, a pathogen that kills an average of 450,000 children every year. The lack of a priority list leads private sector actors to shift resources on the basis of individually determined criteria. Such trade-offs should be determined according to a set of priorities developed by a legitimate political body as opposed to the private sector.

196. The Panel feels that there is a need to prioritize the communicable diseases that receive public support for research and development. Furthermore, the Panel is of the view that WHO is the appropriate institution to establish priorities among the underresearched pathogens that pose a risk of health crises. WHO should also help to identify which technology platforms are best suited to research medical countermeasures. The goal of this effort is to create diagnostics and to shepherd vaccines or therapeutics, as appropriate, through Phase I trials for the top 20 priority communicable pathogens posing a risk of a future health crisis.

Recommendation 13
WHO coordinates the prioritization of global research and development efforts for neglected diseases that pose the greatest threat of turning into health crises.

- The WHO secretariat, informed by advisory groups on immunization and research, creates and maintains a priority list of the communicable diseases most likely to cause a health crisis, and which, therefore, require priority attention in the development of vaccines, therapeutics and rapid diagnostics. Prioritization should be based on clearly defined criteria
- WHO helps to identify technological platforms that have the capacity to accelerate the production of vaccines and therapeutics to address disease outbreaks from novel pathogens or strains

3. Ensuring access to and affordability of medicines

197. Even where vaccines and therapeutics are available, they are often unaffordable or inaccessible for the people most in need. In particular, the Panel recognizes the importance of ensuring adequate access to vaccines for populations affected by a communicable disease outbreak. A number of programmes, such as GAVI, aim to make existing vaccines and drugs available to developing countries at low cost. Similarly, countries can make use of existing flexibilities in the World Trade Organization (WTO) TRIPS Agreement to protect public health or provide access to medicines for all, as called for in Goal 3 (b) of the Sustainable Development Goals.[8] The Panel calls for additional measures to support access to and affordability of medicines.

198. Access to medicines requires more than the ability to obtain affordable drugs on the international market. It also requires an effective system for distributing and administering drugs at the community level, including in rural areas. In the past, efforts to assist developing countries with affordable medicines and vaccines have

[8] Goal 3 (b) reads: "Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all."

sometimes been undermined by the absence of a functioning health system, because the drugs could not be delivered to patients or because regular patient follow-up could not be guaranteed. In this context, institutions such as GAVI and the Global Fund devote a proportion of their resources to strengthening health systems and supply chains.

Recommendation 14
Urgent measures are taken to ensure universal access to and affordability of medicines, vaccines and other life-saving products.

- Given the gap between the need to recover investments and finance research, and the need for affordable medicines, additional public funds are made available to support universal access to and affordability of medicines, vaccines and other life-saving products
- Strengthen efforts to ensure access to and affordability of medical products through GAVI, the Global Fund, and other initiatives such as UNITAID
- Increase the use of generic products so as to make medicines more affordable
- Countries and partners provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health. In this context, the full flexibilities of the TRIPS Agreement should consistently be used

4. Ensuring the timely sharing of biomaterials

199. In the event of an outbreak, the development of medical countermeasures for a new pathogen requires that samples be made available to research and development laboratories around the world quickly. While there is no formal legal obligation to do so, most countries affected by an outbreak have willingly shared relevant biomaterials and samples with WHO and international research laboratories, so as to speed up the development of response measures. However, in recent years, there has been growing concern over the equitable distribution of benefits, including vaccines or treatments, derived from these samples. In a highly publicized case in 2006, the Minister for Foreign Affairs of Indonesia announced that his country would not share the strain of the H5N1 (Avian Influenza) virus that was affecting the country with foreign laboratories. Explaining its decision, the Government of Indonesia specifically noted that foreign scientists were carrying out research on the outbreak without Indonesian participation. Furthermore, it was noted that a multinational company was developing a vaccine against the virus, but that it was not clear that the people most affected by the virus in Indonesia would be able to benefit from the vaccine. The Government of Indonesia justified its decision in part by reference to the Convention on Biological Diversity, which asserts that countries hold a sovereign right to their biological resources, and includes principles for access and benefit-sharing. The case sparked a debate over the equitable compensation and sharing of benefits required for the provision of biomaterials, and informed the negotiations of two legal instruments on the issue.

200. The first is the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Adopted in 2010 as a supplemental agreement to the Convention on Biological Diversity, the Nagoya Protocol provides a legal framework for the fair and equitable sharing of benefits

arising from the utilization of genetic resources. The Protocol entered into force in 2014. While the Protocol addresses the sharing of biomaterials in the context of emergencies, some observers feel that its procedures are too cumbersome to ensure a rapid response, while other experts are not certain if the Protocol applies to novel pathogens.

201. The second is the WHO Pandemic Influenza Preparedness Framework (PIP Framework), negotiated by WHO member States in the light of the decision by Indonesia in 2006. The PIP Framework lays out a streamlined process for the sharing of influenza viruses with pandemic potential and creates mechanisms to ensure fair and equitable access to the benefits that arise from such sample sharing, most notably in the case of pandemic vaccines. However, the PIP Framework applies exclusively to the narrow set of influenza viruses with pandemic potential, and does not address the sharing of other pathogens, including Ebola and MERS. Furthermore, the Framework is not legally binding under international law, and follow-up to its voluntary benefit-sharing provisions has been weak.

202. Despite the existence of two instruments covering the sharing of biomaterials, there is still considerable legal uncertainty as to the conditions under which future emerging pathogens may or must be shared. The Panel is of the view that clear, legally binding guidelines should be developed for the sharing of biomaterials in the context of a health crisis, including provisions on fair and equitable benefit-sharing. The Panel recommends that WHO invite its member States to negotiate a broadening of the coverage of the PIP Framework beyond influenza viruses, while taking into account the principles of the Nagoya Protocol.

Recommendation 15
WHO convenes its member States to renegotiate the Pandemic Influenza Preparedness Framework with a view to including other novel pathogens, making it legally binding, and achieving an appropriate balance between obligations and benefits, in accordance with the principles of the 2010 Nagoya Protocol to the Convention on Biological Diversity.

5. Promoting non-pharmaceutical medical research

203. Beyond the demand for more research and development for vaccines, therapeutics and diagnostics, there is also a need to promote research innovation in non-pharmaceutical tools, equipment and approaches that are essential in dealing with health crises. The implementation of mobile health (mHealth), the use of mobile phones for the entering, tracking and sharing of data by community health workers, is an important innovation in ground-level surveillance that should be expanded. WHO should coordinate and encourage research on new and innovative measures for health preparedness, surveillance and response. Developing national science and engineering research capacities will also enable national response mechanisms to be more flexible and adaptable in responding to health crises.

6. Building research and development capacity in developing countries

204. There is a significant disparity between research, development and manufacturing capacities for medicines in developed and emerging economies and least developed countries. The establishment of even basic research, development and manufacturing capacities in least developed countries would help to build epidemiological capabilities and create training opportunities for local doctors. It

would also leverage local knowledge about the diseases prevalent in a region, help to build laboratory capacity and ensure greater domestic supply of medical countermeasures in case of an outbreak.

Recommendation 16
WHO leads efforts to assist developing countries in building research and manufacturing capacities for vaccines, therapeutics and diagnostics, including through South-South cooperation.

- WHO and its partners accelerate technical and financial support to initiatives such as the Developing Country Vaccine Manufacturers Network
- Efforts are made to leverage available South-South expertise
- Critical research programmes in the biological and social sciences, veterinary services, engineering and related fields are developed and supported

7. Developing protocols for medical research in outbreak situations

205. There is a need to develop better protocols for the conduct of clinical trials in outbreak situations. The West African Ebola outbreak has shown that the application of standard protocols for the testing of new drugs, including randomized control trials, in the context of an acute health crisis raised a number of ethical concerns. In particular, concerns were raised over whether, in the context of an outbreak of a disease with a high mortality rate, it was justifiable to prevent some "control group" patients from accessing experimental drugs, as is standard practice in a randomized control trial. There were also concerns that not all patients participating in the trials had been adequately informed of the risks. Many of these concerns should be addressed through the creation of relevant standards by WHO.

8. Establishing a treaty on emergency measures during a public health emergency of international concern

206. To address regulatory requirements and other challenges to accelerate an international response in the case of a PHEIC, the Panel is of the view that an international agreement should be negotiated that lays out time-bound extraordinary measures to facilitate a rapid global response. These "emergency measures" could include special provisions on the sharing of biomaterials; protocols for the testing of experimental vaccines in the context of outbreak; access to medical countermeasures and vaccines; automatic visas and medical clearances for pre-screened response workers; access to medical evacuation to pre-specified treatment locations; overflight rights, and exemptions from customs for relevant response materials.

C. Finance and economic measures

207. Establishing a more effective system to prevent and respond to health crises will require robust and sustained investment. Ensuring adequate preparedness for the early detection of communicable disease outbreaks, putting in place a comprehensive early response system, and targeting research and development to support these efforts cannot be achieved without substantial financing. However, the

investments needed are small compared with the significant costs imposed by epidemics, both in terms of lives lost and forgone economic growth.

208. In its consultations, the Panel observed that six different concerns related to finance need be addressed.

1. Mobilizing financing for the International Health Regulations core capacities

209. Financing constitutes a key constraint in implementing the IHR core capacities. While the Panel calls upon all countries to allocate a greater proportion of their national budgets to the health sector, including building the IHR core capacities, it recognizes that many countries, particularly least developed countries, will also require significant international assistance.

210. Several initiatives are already under way to assist countries with the implementation of IHR, and these commitments should be honoured. For example, in 2014 the United States launched the Global Health Security Agenda, together with several partner countries, and WHO, the World Organization for Animal Health and the Food and Agriculture Organization of the United Nations (FAO). The Agenda commits to assisting 30 countries in implementing the IHR core capacities over the next five years. The United States alone pledged $1 billion to support this effort. While the remit of the Agenda goes beyond the IHR core capacities, it nonetheless provides a valuable source of funding and expertise to support the implementation of IHR in developing countries. In October 2015, the Group of Seven Health Ministers agreed to offer to assist at least 60 countries, including the countries of West Africa, over the next five years to implement IHR, including through the Global Health Security Agenda and its common targets and other multilateral initiatives. Such initiatives should be expanded and considered among the sources of financial support for the proposed periodic review of compliance with the IHR core capacity requirements.

211. To complement existing bilateral and plurilateral efforts to support the building of the IHR core capacities, the Panel recommends that WHO take the leadership in identifying additional sources of financial and technical support. The goal should be to ensure that all countries participating in the periodic review of compliance with IHR core capacity requirements enjoy guaranteed financial support, as needed, to address gaps identified in the review.

Recommendation 17
The Director-General of WHO leads urgent efforts, in partnership with the World Bank, regional development banks, other international organizations, partners, foundations and the private sector, to mobilize financial and technical support to build the IHR core capacities.

2. Ensuring sustainable funding for a WHO centre for emergency preparedness and response

212. Even if all countries achieve compliance with the IHR core capacity requirements, there is still a need for a strong central operational capacity to rapidly respond in case of major outbreaks that could not be contained by the country alone. WHO, as the lead United Nations agency for health, should develop this capacity in the form of a centre for emergency preparedness and response, as outlined in

recommendation 7. As the proposed centre would carry out core surveillance and response activities, it should be financed from assessed contributions to WHO.

213. In this context, the Panel noted that while earmarked funding has increased significantly, the assessed budget of WHO has remained unchanged for several years. The current annual assessed budget of WHO, the lead organization on global health, stands at $465 million. The organization's emergency response work is exclusively financed from voluntary contributions. As a result, funding for these core activities is unpredictable and often insufficient. In some cases, the WHO preparedness, surveillance, and response capacity receives less than half of the funding required.

214. In the light of the foregoing, the Panel strongly encourages member States to increase the organization's assessed funding by at least 10 per cent. These additional funds should be used to cover some of the additional functions assigned to WHO, including its strengthened periodic review of IHR core capacities and the operational costs of a WHO centre for emergency preparedness and response.

Recommendation 18
The WHO member States increase their assessed contributions to the WHO budget by at least 10 per cent.

215. In the light of the significant financial needs arising from the strengthening of the WHO emergency response capacities, which are a global public good, the Panel further recommends that 10 per cent of all voluntary contributions to WHO — in addition to programme support costs — be mandatorily allocated to supporting the WHO emergency response capacities.

Recommendation 19
Ten per cent of all voluntary contributions to WHO — beyond programme support costs — are mandatorily directed to support the centre for emergency preparedness and response.

3. Financing a robust emergency response

216. To date, most emergency response activities to contain an outbreak rely on voluntary funding. There are no significant resources available that could be used at short notice. When a PHEIC is declared, the availability of funding usually improves as more partners pledge support. However, the delivery of pledged funds can take valuable time that may delay initial response efforts. There is a need to fill the gap until voluntary pledged funds for the response are received. Thus, while voluntary funds are of crucial importance, they cannot be a substitute for timely and predicable funding.

217. Recognizing this need, WHO has recently established a Contingency Fund for Emergencies, of $100 million. The Panel supports the establishment of such a fund. In the light of the fact that an early, robust response has the greatest chance of reining in an outbreak, the Panel is of the view that expanding the Fund to $300 million would greatly enhance its efficacy. The Contingency Fund should be fully funded from assessed contributions (according to the current scale of assessments) and replenished by the same method.

218. Furthermore, much voluntary assistance is provided bilaterally to specific organizations or groups, leaving WHO without the necessary leverage to coordinate

response programmes effectively. Therefore, the newly established Contingency Fund should be made available for use not just by WHO, but also by other health responders.

Recommendation 20
Member States finance the WHO Contingency Fund for Emergencies with at least $300 million by the end of 2016.

- The Contingency Fund is available for use by Health Cluster members, under the coordination of WHO
- To ensure predictable financing, the Contingency Fund is fully funded by member States according to the scale of their current assessment. It is fully financed by the end of 2016 and immediately replenished when depleted

219. Similarly, the pandemic emergency financing facility proposed by the World Bank could play a key role in financing early response. The facility would use a combination of concessional finance instruments and innovative insurance mechanisms to make funds available to affected countries as soon as pre-defined criteria related to an outbreak are met. This would provide countries with much needed financial assistance in the early days of a crisis.

Recommendation 21
The World Bank rapidly operationalizes the pandemic emergency financing facility.

- The annual premiums for the pandemic emergency financing facility for least development countries are covered by additional resources from partners
- The payouts of the pandemic emergency financing facility are prioritized by the national authorities of the affected country, in accordance with national response plans, with appropriate organizations providing technical support

4. Financing research and development for neglected diseases with health crisis potential

220. Given the high cost of vaccine development, significant funds will be needed to ensure greater research and development of neglected diseases. In 2013, only $3.2 billion was spent on more than 20 neglected tropical diseases, while at least $500 million was spent to develop an Ebola vaccine during the outbreak. There is a need for adequate funding to support the development of vaccines or countermeasures against the prioritized list of pathogens most likely to bring about a health crisis (see recommendation 13). The goal is to ensure availability of candidate vaccines and drugs that have passed Phase I of clinical trials, so as to be able to conduct rapid trials and scale up production in case of an outbreak.

221. The Panel recommends the creation of a fund of $1 billion dedicated to supporting research and development on vaccines, therapeutics and diagnostics for neglected communicable diseases that are prioritized by WHO. The fund should also be used — as needed — to support and incentivize research and development during a crisis. It should be replenished on an annual basis and be considered an integral part of the global preparedness for health crises.

222. To incentivize research and development most effectively, the incentive structures used should be specific to each pathogen identified and draw on the broad range of available economic and regulatory mechanisms.

Recommendation 22
WHO oversees the establishment and management of an international fund of at least $1 billion per annum to support the research and development of vaccines, therapeutics and rapid diagnostics for neglected communicable diseases.

- This fund is targeted at building protection against future health crises and should supplement existing mechanisms that are supporting research and development efforts to identify vaccines, therapeutics and diagnostics for existing endemic communicable diseases such as malaria, tuberculosis and HIV/AIDS
- The fund is used to incentivize research and development efforts on the vaccines, therapeutics and rapid diagnostics that are on the priority list of pathogens identified by advisory committees to the World Health Assembly
- Depending on each pathogen, targeted methods are used to incentivize research and development, so as to achieve rapid results with the least cost

5. Mitigating the economic consequences of health crises

223. Experience with the SARS, H1N1 and Ebola outbreaks have shown that communicable diseases often have significant economic consequences that reach far beyond the initially affected countries. In the case of the Ebola outbreak in West Africa, approximately 70 countries imposed more than 500 travel or trade restrictions on travellers or goods from affected countries, in excess of the temporary measures recommended by the WHO Emergency Committee. These restrictions — many of which remain in place — have imposed significant economic costs on the affected countries and the globe.

224. Measures to prevent such economic consequences are required for three reasons. First, the consequences of an economic contraction caused by a disease are often more far-reaching and devastating than the outbreak itself and should therefore be addressed in their own right. Secondly, the fear of adverse economic effects following the public declaration of an outbreak constitutes a significant disincentive to the early reporting of outbreaks to WHO. Thirdly, travel and trade restrictions can hamper international response efforts by preventing the travel of response workers or the importation of critical response materials. Therefore, building better mechanisms to prevent or address economic consequences from health crises is an integral part of any global system to respond to health crises.

225. As the balancing of public health concerns and the free flow of travel and trade is the explicit goal of IHR, the Panel feels that the IHR Review Committee is best placed to examine ways to prevent or address the adverse economic consequences of health crises, particularly after the declaration of a PHEIC. However, the Panel notes that several avenues could be explored to achieve this.

226. First, financial mechanisms could be developed to help to compensate countries affected by a PHEIC for the economic losses that result from trade and travel restrictions imposed by other countries and/or as a result of private decisions. The use of insurance-based mechanisms, similar to the pandemic emergency

financing facility, could be explored in this context, as could the use of non-insurance compensation mechanisms such as grants or loans.

227. Secondly, consideration could be given to strengthening IHR compliance mechanisms. To date, the temporary recommendations made by the Director-General of WHO when declaring a PHEIC are not legally binding on member States. IHR explicitly recognize the right of States parties to implement health measures that achieve a greater level of protection than those recommended by WHO. However, IHR require that these measures be no more restrictive to trade and travel than necessary and be based on scientific principles, available scientific evidence and/or WHO guidance. Such measures need to be brought to the notice of WHO, and the organization may request that member States review their application. However, no further action is currently outlined in IHR if a country introduces a measure that is not justified by scientific principles or evidence. Therefore, consideration could be given to strengthening the review powers of WHO and awarding compensation in the event that trade and travel restrictions are determined to have exceeded the temporary recommendations of WHO without adequate justification.

228. Thirdly, mechanisms should be found to address excessive travel restrictions and visa bans in the event of a PHEIC. Given the importance of obtaining adequate numbers of medical and humanitarian staff to respond to health crises, special attention should be paid to restrictions that prevent the travel of these workers.

229. Finally, the impact of fear among the public at large needs to be addressed. A significant proportion of the adverse economic impact associated with a PHEIC derives from aversion behaviour by private consumers such as tourists. As public fear lies outside the realm of regulation, there is a need to raise awareness to ensure that individuals make well-informed decisions about the risks related to travelling to or buying goods from affected countries.

Recommendation 23

The IHR Review Committee considers developing mechanisms to rapidly address unilateral action by States and others that are in contravention of temporary recommendations issued by WHO as part of a PHEIC announcement.

230. The Panel notes that there is scope to strengthen coherence between IHR and the WTO agreements with regard to trade restrictions imposed in the context of IHR.

231. Trade restrictions imposed in response to an outbreak may fall under both IHR and under the legal framework of WTO. If a dispute arises regarding a trade restrictive measure taken in response to IHR notifications, affected countries can challenge it under either legal agreement, as neither takes clear precedence.

232. However, the procedures foreseen for dispute settlement differ significantly. IHR urges States parties to "settle the dispute through negotiation or any other peaceful means of their own choice". Should this not lead to a resolution, the parties may bring the dispute to the Director-General of WHO. In contrast, WTO has a strong, institutionalized dispute settlement mechanism that can legally oblige Governments to withdraw trade measures that violate WTO law, or authorize the injured party to withdraw trade concessions in return.

233. Should a trade measure taken in response to IHR notification be challenged in WTO, there is a need to ensure that international standards and relevant guidance issued by WHO (including the temporary recommendations issued by the Director-General when declaring a PHEIC) are adequately taken into account. Consideration should also be given to strengthening the legal standing of related WHO guidance in the WTO legal framework, as was achieved for the standards, guidelines or recommendations of three other organizations in the WTO Agreement on the Application of Sanitary and Phytosanitary Measures.

234. The Panel, therefore, suggests that the WTO and WHO secretariats convene a joint commission of experts to study the two legal frameworks, and to make recommendations to strengthen coherence in the treatment of restrictive trade measures imposed for public health reasons.

Recommendation 24
WTO and WHO convene an informal joint commission of experts to study possible measures to strengthen coherence between IHR and the WTO legal frameworks regarding trade restrictions imposed for public health reasons.

6. Strengthening aid effectiveness and accountability

235. Several national interlocutors raised concerns about the fragmentation of international programmes implemented in their countries without adequate coordination with the relevant authorities. This often leads to the fragmentation of international efforts and creates duplication of programming and a reduction of aid effectiveness. Against this backdrop, the Panel reiterates the importance of adherence to existing international commitments in this area.

Recommendation 25
Countries and partners comply with the Paris Declaration on Aid Effectiveness, the Accra Agenda for Action and the Busan Partnership agreement, particularly with regard to the alignment of support, the harmonization of efforts and mutual accountability.

- All international actors systematically inform Governments of their aid contributions to countries and coordinate their programmes with relevant line ministries
- In an emergency response situation, the Emergency Coordinator is responsible for supporting the Government in ensuring that international assistance is effectively coordinated

VI. Follow-up and implementation

236. The Ebola outbreak in West Africa in 2014 was only the most recent in a series of communicable disease outbreaks that could have been more rapidly contained. Had an effective global health architecture been in place, the scope of the outbreak would have been significantly reduced and thousands of cases and deaths would have been averted. The present report outlines key reforms that need to be implemented to establish such a system and make the world safer from pandemic threats.

237. However, the Panel is gravely concerned that — as has happened so many times before — the political momentum to make critical changes will be lost, and that much needed investment will not be forthcoming. Recent history does not inspire confidence.

238. In the past 20 years, several similar efforts were made to better protect the world from communicable diseases. All were prompted by the experience of recent disasters, and all were ultimately unsuccessful.

239. Ironically, in 1995, it was the slow response to an Ebola outbreak in Kikwit, Democratic Republic of the Congo, along with two outbreaks of other diseases, which created the global resolve to revise IHR, with a view to strengthening the global response. However, this resolve evaporated, and negotiations stalled.

240. It was the SARS epidemic of 2003 that provided the necessary impetus to complete negotiations on IHR, which entered into force in 2007.

241. In 2009, an H1N1 pandemic influenza outbreak that killed an estimated 300,000 people led to a review of IHR. The review recommended the implementation of many of the same reforms as are recommended by the Panel, including the creation of a contingency fund for pandemic response, the creation of a global health workforce, and the strengthening of the WHO outbreak response capacities. Most of these recommendations were not taken up.

242. Instead, in 2009/10, member States cut the WHO overall biennial budget by $500 million, and staff levels in the organization's emergency response sections were significantly reduced. In May 2015 — when the Ebola outbreak had just passed its peak — a proposal for a mere 5 per cent increase in the WHO assessed budget met with resistance in the World Health Assembly. And at the time of writing, total contributions to the WHO newly established Contingency Fund for Emergencies stand at $14.3 million, a far cry from the envisioned $100 million.

243. Already, new issues such as migration and conflict have pushed the threat of pandemics from the headlines, threatening a further loss of resolve and potential funding for health crisis response.

244. The Panel was informed that the absence of political leadership at the country, regional and international levels with respect to preparedness for and response to health crises has been a critical factor in undermining effective action. Priority action relating to pandemics must be led by Heads of State and Government.

245. Against this backdrop, the Panel is convinced that a mechanism is needed to maintain current momentum and ensure the implementation of crucial reforms. The Panel, therefore, urges the General Assembly to create a "high-level council on global public health crises".

246. The high-level council would be tasked with monitoring the implementation of the recommendations of this Panel and related reforms in strengthening the global public health architecture. It will submit regular progress reports to the General Assembly.

247. To ensure that the issue of health crises remains high on the global agenda, the council should also oversee the establishment of a preparatory committee for the organization of a summit on global public health crises, to be held in 2018.

Recommendation 26

The United Nations General Assembly immediately creates a high-level council on global public health crises to ensure that the world is prepared and able to respond to public health crises.

- **The high-level council monitors political and non-health issues related to prevention and preparedness imperatives for a potential epidemic of global proportions that could have unprecedented implications on economies, movement of people and stability, as well as recovery. It will reaffirm guidance during times of health crises and will intervene in affected fields outside the health field**
- **The high-level council monitors and reports regularly to the General Assembly on the implementation of the adopted recommendations of the High-level Panel on the Global Response to Health Crises at the country, regional and international levels**
- **The high-level council ensures that the adopted recommendations of the High-level Panel are implemented in a timely manner**
- **The high-level council is composed of political representatives of between 45 to 50 Member States, elected by the General Assembly**
- **The high-level council supports the substantive preparations for a summit on global public health crises**

Recommendation 27

A summit on global public health crises is convened in 2018 to focus on preparedness and response to health crises.

248. It is the hope of the Panel that the high-level council will elevate the issue of global public health crises to its rightful place on the international agenda.

Annex I

Glossary

1. **Assessed contributions** — The dues that member States of the World Health Organization must pay in order to be a member of the organization, which are calculated relative to the country's economic output and population.[a]

2. **Biosafety levels** — Four tiered biosafety levels guiding the appropriate laboratory handling and containment of microbes and pathogens. The levels are determined by the degree of infectivity, severity of disease, transmissibility, and the nature of the work conducted, among others.

Biosafety level 1 — pathogens are not known to consistently cause disease in healthy adults and present minimal potential hazard to laboratorians and the environment (e.g., E. coli).

Biosafety level 2 — pathogens pose moderate hazards to laboratorians and the environment (e.g., staphylococcus aureus).[b]

Biosafety level 3 — pathogens that can cause serious or potentially lethal disease through respiratory transmission (e.g., mycobacterium tuberculosis).[c]

Biosafety level 4 — The highest level of biological safety, there are a small number of biosafety level 4 laboratories around the world. These pathogens pose a high risk of aerosol-transmitted infections, which are often fatal and which lack treatment or a vaccine. (Two examples of microbes worked with in biosafety level 4 laboratories include the Ebola and Marburg viruses.)[d]

3. **Communicable disease** — Diseases that spread from one person to another or from an animal to a person.[e]

4. **Community health worker** — Community health workers are low-skilled, essential members of the public health workforce.[f] Tasks that they may perform include: home visits; environmental sanitation; first aid and treatment of simple and common ailments; health education; nutrition and surveillance; maternal and child health and family planning activities; tuberculosis and HIV/AIDS care; malaria control; treatment of acute respiratory infections; communicable disease control; community development activities; referrals to higher levels of care; and record-keeping.[g]

5. **Coronavirus** — A coronavirus is a type of common virus that typically causes only mild to moderate upper respiratory illness. The exceptions are severe acute respiratory syndrome (SARS), identified in 2003, and Middle East respiratory syndrome-coronavirus (MERS-COV), identified in 2012, which have both led to epidemics of different proportions and severity in the past 15 years.[h]

---

[a] www.who.int/about/funding/assessed/en/.
[b] www.cdc.gov/training/QuickLearns/biosafety/.
[c] www.cdc.gov/training/QuickLearns/biosafety/.
[d] www.cdc.gov/training/QuickLearns/biosafety/.
[e] www.globalhealth.gov/global-health-topics/communicable-diseases/.
[f] www.who.int/hrh/statistics/TechnicalNotes.pdf.
[g] www.who.int/hrh/documents/community_health_workers_brief.pdf.
[h] hwww.cdc.gov/coronavirus/.

6. **Drug development process** — A process of tiered clinical drug testing:

Phase I trial. During Phase I studies, researchers test a new drug to evaluate its safety.

Phase II trial. In Phase II studies, researchers administer the drug to a group of patients with the disease or condition for which the drug is being developed to test for efficacy, as well as again for safety.

Phase III trial. Researchers design Phase III studies to further demonstrate efficacy and safety in a larger group of human subjects (from several hundred to several thousand) and to compare the treatment against any others in existence.[i]

7. **Emergency Response Framework** — The purpose of the Emergency Response Framework is to clarify the roles and responsibilities of WHO and to provide a common approach for its work in emergencies. Ultimately, the Framework requires WHO to act with urgency and predictability to best serve and be accountable to populations affected by emergencies.[j]

8. **Endemic** — Refers to the constant presence and/or usual prevalence of a disease or communicable agent in a population within a geographic area.[k]

9. **Epidemic** — The occurrence in a community or region of cases of an illness, specific health-related behaviour, or other health-related events clearly in excess of normal expectancy. The number of cases indicating the presence of an epidemic varies according to the agent, size, and type of population exposed, previous experience or lack of exposure to the disease, and time and place of occurrence.[l]

10. **Foreign medical team** — A unit contributed by an institution or country that is deployed by WHO to provide emergency care to patients with epidemic diseases, traumatic injuries and other life-threatening conditions.[m]

11. **H1N1 Influenza** — An influenza virus originating in pigs that was the cause of a pandemic in 2009, but is now seasonally circulated worldwide.[n]

12. **H5N1 Influenza** — An Avian Influenza virus with a mortality rate of about 60 per cent that has thus far demonstrated little human to human transmission.[o]

13. **Health care** — The provision of services to maintain and improve physical and mental health.[p]

14. **Health Cluster** — A cluster is a group of agencies that gather to work together towards common objectives within a particular sector of emergency response.[q] WHO is the lead agency for the Global Health Cluster, which currently includes more than 30 humanitarian partner agencies, organizations and institutions.[r]

---

[i] www.who.int/ictrp/glossary/en/#TrialPhase.
[j] www.who.int/hac/about/erf/en/.
[k] www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section11.html.
[l] www.who.int/hac/about/definitions/en/.
[m] www.who.int/hac/global_health_cluster/fmt/en/.
[n] www.cdc.gov/h1n1flu/updates/042609.htm.
[o] www.cdc.gov/h1n1flu/updates/042609.htm.
[p] www.oxforddictionaries.com/us/definition/american_english/healthcare.
[q] www.who.int/hac/techguidance/tools/manuals/who_field_handbook/annex_7/en/.
[r] www.who.int/hac/about/faqs/en/index3.html.

15. **Health crisis** — For the purposes of the present report, the Panel has chosen to focus its attention on health crises arising from outbreaks of new, acute or re-emerging communicable diseases that pose a threat of international spread. In general, a health crisis is an event that exceeds the ability of the health system to contain spread and avoid excess morbidity and mortality, perhaps occurring from a disease outbreak, a natural disaster or some other event.

16. **Health workers** — A diverse spectrum of persons, from low to highly skilled, that support the delivery of health care and public health services.[s]

17. **Health system** — A system designed to coordinate all the activities required to promote, restore and/or maintain health of individuals and populations.[t]

18. **Inter-agency Standing Committee humanitarian emergency levels** — The Inter-Agency Standing Committee (IASC) serves as the primary mechanism for inter-agency coordination relating to humanitarian assistance in response to complex and major emergencies under the leadership of the Emergency Relief Coordinator.[u] IASC assigns humanitarian emergencies to one of three levels: Level 1, consisting of emergencies capable of being handled by agency country offices; Level 2, consisting of emergencies requiring mobilization of resources beyond country offices, such as those at a regional level; and Level 3, requiring humanitarian system-wide activation.

A Level 3 or L3 emergency refers to a major sudden-onset humanitarian crisis triggered by a natural disasters or conflict which requires system-wide mobilization to ensure a more effective response to the humanitarian needs of affected populations. This exceptional measure is only applied in exceptional circumstances where the gravity justifies mobilization beyond normally expected levels, while recognising the complementarity of humanitarian systems. The designation of an L3 emergency, in consultation with the IASC Principals, is issued by the Emergency Relief Coordinator, on the basis of an analysis of five criteria: scale, complexity, urgency, capacity, and reputational risk.[v]

19. **Infection Prevention and Control** — The basic principles used to prevent the spread of infection to others, especially in health-care facilities and public places.[w]

20. **International Health Regulations (2005) (IHR)** — An international legal instrument, whose precursor was the International Sanitary Regulations, which is binding on 196 States parties across the globe, including all the member States of WHO. The goal of IHR is to prevent, protect against, control and respond to the international spread of disease, while avoiding unnecessary interference with international traffic and trade. Among other responsibilities and obligations, IHR require countries to report certain disease outbreaks and public health events to WHO. The latest revision of IHR were agreed in 2005, and entered into force on 15 June 2007.[x]

21. **IHR core capacity** — The International Health Regulations 2005 defines core capacity requirements for each of the 196 countries that are party to IHR to ensure

[s] www.who.int/whr/2006/06_chap1_en.pdf.
[t] www.who.int/healthsystems/hss_glossary/en/index5.html.
[u] interagencystandingcommittee.org/iasc/membership-and-structure.
[v] https://interagencystandingcommittee.org/node/2564.
[w] www.who.int/topics/infection_control/en/.
[x] www.who.int/ihr/about/faq/en/.

that all countries have the ability to detect and respond appropriately to any potential public health emergency of international concern (PHEIC).[y]

22. **IHR Review Committee** — The International Health Regulations (2005) call for the establishment of a review committee following the resolution of each health crisis situation designated a PHEIC. The Review Committee is charged with assessing the effectiveness of IHR with regard to the prevention, preparedness and response to the crisis. An IHR Review Committee was appointed in August 2015 to look at functioning of IHR in the Ebola epidemic in West Africa.

23. Least developed countries — Least developed countries refer to low-income countries confronting severe structural impediments to sustainable development. Currently, there are 48 countries designated by the United Nations as least developed. The income criterion is measured by the gross national income (GNI) per capita, and provides information on the income status of a country. The threshold for inclusion is based on a three-year average of the level of GNI per capita, which is how the World Bank identifies low-income countries. The threshold for inclusion in the least developed country category will be $1,035 in the 2015 review.[z]

24. **Middle East respiratory syndrome-coronavirus (MERS-CoV)** — A zoonotic virus (transmitted from animals to humans) that was first identified in Saudi Arabia in 2012. MERS is a viral respiratory disease caused by a novel coronavirus (MERS-CoV).[aa]

25. **Mobile Health (mHealth)** — A component of electronic Health (eHealth) that involves the provision of health services and information through mobile technologies such as mobile phones, tablet computers and personal digital assistants (PDAs).[bb]

26. **Nagoya Protocol to the Convention on Biological Diversity** — The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is a supplementary agreement to the Convention on Biological Diversity. It entered into force in 2014 and provides a transparent legal framework for the fair and equitable sharing of benefits arising from the utilization of genetic resources. The Nagoya Protocol is intended to create greater legal certainty and transparency for both providers and users of genetic resources by establishing more predictable conditions for access to genetic resources and helping to ensure benefit-sharing when genetic resources leave the country providing the genetic resources.[cc]

27. **National IHR focal point** — The focal point plays a crucial role in communications both to WHO and to other national bodies engaged in the implementation of IHR and is responsible for its country's coordination, reporting and notification of health events to WHO.[dd]

28. **Neglected diseases** — Neglected diseases are conditions that inflict severe health burdens on the world's poorest people and which are often overlooked by

[y] www.phe.gov/Preparedness/international/ihr/Documents/Cor%20Capacity%205_12.pdf.
[z] www.un.org/en/development/desa/policy/cdp/ldc/ldc_criteria.shtml.
[aa] www.who.int/mediacentre/factsheets/mers-cov/en/.
[bb] www.who.int/tb/areas-of-work/digital-health/definitions/en/.
[cc] www.cbd.int/abs/about/.
[dd] www.who.int/ihr/nfp/en/.

drug developers, policymakers, public health programmes and the news media. Many neglected diseases are communicable diseases that are most prevalent in tropical climates, although they may be found in a range of environments around the world.[cc]

29. **Neglected tropical diseases** — A diverse group of 18 communicable diseases that prevail in tropical and subtropical conditions in 149 countries and affect more than 1 billion people, costing developing economies billions of dollars every year. They mainly affect populations living in poverty, without adequate sanitation, and in close contact with communicable vectors and domestic animals and livestock.[ff]

30. **Non-communicable diseases** — Also known as chronic diseases, these are not communicable, or passed from person to person. They are of long duration and generally slow progression and include cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma), and diabetes.[gg]

31. **Official development assistance (ODA)** — ODA includes flows of monies to countries and territories to multilateral institutions which are: (a) provided by official agencies, including State and local governments, or by their executive agencies; and, (b) each transaction of which: (i) is administered with the promotion of the economic development and welfare of developing countries as its main objective; and (ii) is concessional in character and conveys a grant element of at least 25 per cent (calculated at a rate of discount of 10 per cent).[hh]

32. **One Health** — The One Health approach seeks to improve health and well-being through the prevention of risks and the mitigation of effects of crises that originate at the interface between humans, animals and their various environments.[ii]

33. **Outbreak** — Carries the same definition of epidemic, but is often used for a more limited geographic area.[jj]

34. **Pandemic** — Refers to an epidemic that has spread over several countries or continents, usually affecting a large number of people.[kk]

35. **Pandemic Influenza Preparedness (PIP) Framework** — The PIP Framework brings together member States, industry, other stakeholders and WHO to implement a global approach to pandemic influenza preparedness and response. Its key goals include improving and strengthening the sharing of influenza viruses with human pandemic potential; and increasing the access of developing countries to vaccines and other pandemic-related supplies.[ll]

36. **Pathogen** — An organism that causes disease in human beings, such as a bacterium, virus, parasite or fungi.[mm]

[cc] https://rarediseases.info.nih.gov/files/neglected_diseases_faqs.pdf.
[ff] www.who.int/neglected_diseases/diseases/en/.
[gg] www.who.int/mediacentre/factsheets/fs355/en/.
[hh] www.oecd.org/dac/stats/officialdevelopmentassistancedefinitionandcoverage.htm.
[ii] www.onehealthglobal.net/what-is-one-health/.
[jj] www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section11.html.
[kk] www.cdc.gov/ophss/csels/dsepd/ss1978/lesson1/section11.html.
[ll] www.who.int/influenza/pip/en/.
[mm] www.cdc.gov/vaccines/about/terms/glossary.htm.

37. **Personal protective equipment** — Equipment that is designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, protective equipment includes a variety of devices and garments such as goggles, coveralls, gloves, vests, earplugs, and respirators. Without sufficient training in its use, removal and disposal, personal protective equipment will not provide effective protection.[88]

38. **Public health** — Public health is the science and art of promoting health, preventing disease, and prolonging life through the organized efforts of society.[89]

39. **Public health emergency** — An occurrence or imminent threat of an illness or health condition, caused by events including an epidemic or pandemic disease, that poses a substantial risk of a significant number of human fatalities or permanent or long-term disability.[90]

40. **Public health emergency of international concern (PHEIC)** — A PHEIC indicates an extraordinary event which is determined, as provided in the International Health Regulations (2005):

(a) To constitute a public health risk to other States through the international spread of disease;

(b) To potentially require a coordinated international response.[91]

The Director-General declares the existence of a PHEIC following consultation with the State Party concerned and with the Emergency Committee appointed to develop temporary recommendations for the emergency. In determining whether an event constitutes a public health emergency of international concern, the Director-General shall consider:

(a) Information provided by the State Party;

(b) The decision instrument contained in annex 2 of the International Health Regulations (2005);

(c) The advice of the Emergency Committee;

(d) Scientific principles as well as the available scientific evidence and other relevant information;

(e) An assessment of the risk to human health, of the risk of international spread of disease and of the risk of interference with international traffic.[92]

41. **Sanitary and Phytosanitary Agreement** — The Agreement on the Application of Sanitary and Phytosanitary Measures seeks to strike a balance between the right of WTO members to protect health and the need to allow the smooth flow of goods across international borders. The Agreement recognizes the right of WTO members to adopt legitimate measures to protect food safety and

[88] www.osha.gov/OshDoc/data_General_Facts/ppe-fact-sheet.pdf.
[89] www.who.int/rpc/meetings/wr2004/en/index8.html.
[90] www.who.int/hac/about/definitions/en/.
[91] www.who.int/ihr/procedures/pheic/en/.
[92] www.who.int/ihr/publications/9789241596664/en/.

animal and plant health while ensuring these measures are not applied in an unnecessary manner for protectionist purposes.[ss]

42. **Universal health coverage** — The goal of universal health coverage is to ensure that all people obtain the health services they need without suffering financial hardship. This requires an efficient and well-run health system, health services financing, access to essential medicines and technologies, and a well-trained health workforce.[tt]

43. **Vector-borne disease** — Diseases transmitted to humans by vectors (not other humans or animals), such as mosquitoes and ticks.[uu]

44. **World Health Assembly** — The World Health Assembly is the decision-making body of WHO and determines the policies of the Organization, appoints the Director-General, supervises financial policies, and reviews and approves the proposed programme budget.[vv]

45. **WHO country representative** — The WHO representative in the country of assignment responsible for directing and managing the implementation of programme initiatives. This individual works closely with the host country's Ministries of Government/Health and other non-governmental organizations.[ww]

46. **WHO emergency grades** — WHO categorizes emergencies into four grades depending on specific criteria:

(a) Ungraded: an event that is being assessed, tracked or monitored by WHO but that requires no WHO response at the time;

(b) Grade I: a single or multiple country event with minimal public health consequences that requires a minimal WHO country office response or a minimal international WHO response. Organizational and/or external support required by the country office is minimal. The provision of support to the country office is coordinated by a focal point in the regional office;

(c) Grade II: a single or multiple country event with moderate public health consequences that requires a moderate WHO country office response and/or moderate international WHO response. Organizational and/or external support required by the country office is moderate. An emergency support team, run out of the regional office (the emergency support team is only run out of headquarters when multiple regions are affected) coordinates the provision of support to the country office;

(d) Grade III: a single or multiple country event with substantial public health consequences that requires a robust WHO country office and/or international WHO response. An emergency support team, run out of the regional office, coordinates the provision of support to the country office.[xx]

47. **Zoonotic disease** — A disease that can be passed between animals and humans. Zoonotic diseases can be caused by viruses, bacteria, parasites, and fungi.[yy]

[ss] www.wto.org/english/thewto_e/20y_e/sps_brochure20y_e.pdf.
[tt] http://www.who.int/universal_health_coverage/en/.
[uu] http://ecdc.europa.eu/en/healthtopics/emerging_and_vector-borne_diseases/vector-borne_diseases/pages/index.aspx.
[vv] http://www.who.int/mediacentre/events/governance/wha/en/.
[ww] http://apps.hr.emory.edu/JobDescriptions/class.jsp?code=XA29.
[xx] www.who.int/hac/donorinfo/g3_contributions/en/.
[yy] www.cdc.gov/onehealth/zoonotic-diseases.html.

Annex II

Key dates for the crisis and response

2013

28 December — Patient Zero, a two-year-old child, dies.

2014

18 March — Guinean health officials announce the outbreak of a haemorrhagic fever, reporting 35 cases and at least 23 dead. On 22 March, Guinea announces that the fever has been confirmed as Ebola.

End of March 2014 — WHO announces 112 cases and 70 deaths in Guinea as being suspected or confirmed owing to Ebola. The Ministry of Health of Liberia confirms its first cases of Ebola virus disease with two patients in Lofa and Nimba counties. Three suspected cases have also been reported in Sierra Leone.

End of April — WHO announces 239 cases and 160 deaths overall in Guinea, Liberia and Sierra Leone.

19 May — The Minister of Health of Guinea briefs the World Health Assembly on the Ebola situation in his country and notes encouraging results.

End of May — WHO announces 383 cases and 211 deaths overall in Guinea, Liberia and Sierra Leone.

17 June — Liberia reports that Ebola has reached its capital, Monrovia.

21 June — Médecins sans frontières declares the second wave of the outbreak out of control and calls for massive resources to combat the epidemic.

End of June — WHO announces 779 cases and 481 deaths overall in Guinea, Liberia and Sierra Leone.

12 July — The first case in the capital city of Sierra Leone, Freetown, is recorded.

20 July — An airline passenger, Patrick Sawyer, a top government official in the Ministry of Finance of Liberia, introduces the virus from Liberia into Lagos, Nigeria. This is the first time that Ebola enters a new country through international air travel. That event triggers urgent plans to organize an emergency committee to assess the Ebola situation under the provisions in the International Health Regulations (IHR). Sawyer dies at a Nigerian hospital on 25 July.

29 July — Dr. Sheik Umar Khan, Sierra Leone's top haemorrhagic fever expert, dies from Ebola. Dr. Khan is the most high-profile health worker to succumb to the disease thus far. Close to 500 health workers will die from the disease during the epidemic.

30 July — Liberia shuts schools and orders the quarantining of the worst-affected communities, employing its military. Sierra Leone begins to deploy troops to enforce quarantines.

End of July — WHO announces 1,603 cases and 887 deaths overall in Guinea, Liberia and Sierra Leone.

6-7 August — The first meeting of the WHO Emergency Committee under IHR regarding the Ebola virus disease outbreak in West Africa is held by teleconference. The Committee reaches unanimous agreement that the Ebola outbreak should constitute a PHEIC according to IHR, and conveys that finding, along with the Committee's temporary recommendations, to the Director-General of WHO.

8 August — The Director-General of WHO declares the epidemic a PHEIC.

12 August — A WHO panel of experts approves the usage of unproven drugs and vaccines. Clinical trials are subsequently begun on several treatment and vaccine candidates.

27 August — WHO launches a "road map" to respond to the epidemic, setting out strategies, categories of risk levels in countries and time-bound objectives.

29 August — Senegal confirms its first case of Ebola, a Guinean citizen who had travelled to Dakar. The man recovers and no other cases are reported. Senegal is declared Ebola-free on 17 October 2014.

End of August — WHO statistics show 3,707 cases and 1,808 deaths overall in Guinea, Liberia and Sierra Leone.

1-19 September — An emergency session of the Security Council is convened on 18 September to assess the implications of the epidemic as a threat to international peace and security. The General Assembly and the Security Council approve resolutions creating UNMEER, the first time that the United Nations has created a mission for a health emergency.

22 September — WHO reports an overall total of 20 cases and 8 deaths in Nigeria. The country is declared Ebola-free on 20 October.

End of September — WHO statistics show 7,157 cases and 3,330 deaths overall in Guinea, Liberia and Sierra Leone.

24 October — A two-year-old Guinean girl dies of Ebola in Mali, the country's first case of Ebola. No cases of transmission occur.

27 October — A Guinean imam dies at a clinic in Bamako, Mali, in a second, unrelated chain of transmission. The case is not diagnosed until 11 November, when a nurse at the clinic is confirmed to have Ebola. A total of eight cases and six deaths are reported in total from the two outbreaks in Mali.

End of October — WHO statistics show 13,540 cases and 4,941 deaths overall in West Africa in Guinea, Liberia and Sierra Leone. WHO reports that the rate of infections in Liberia has slowed, owing in part in changes in cultural mortuary practices. A more comprehensive assessment of patient databases leads to an increase in total cases recorded by WHO of an additional 3,792 cases, which have occurred throughout the period of the epidemic.

End of November — WHO statistics show 15,901 cases and 5,674 deaths overall in Guinea, Liberia and Sierra Leone.

18-19 December — The Secretary-General, Ban Ki-moon, pledges support for affected countries in West Africa to rebuild their health systems while travelling in the region.

End of December — WHO statistics show 20,171 cases and 7,890 deaths overall.

2015

18 January — The Government of Mali and WHO declare the country Ebola-free.

21 January — Guinea, Sierra Leone and Liberia all report the lowest weekly infection rates since August 2014.

5 March — Liberia releases its last confirmed case of Ebola. On 9 May, WHO declares Liberia to be Ebola-free.

29 June — A new outbreak of Ebola in Liberia leads to six cases and two deaths. In November 2015, a second recurrence leads to three further cases and one death in Liberia. Both outbreaks are linked to transmission by Ebola survivors.

31 July — An Ebola vaccine is reportedly proven effective in clinical trials in Guinea.

31 July — UNMEER ends, transferring its lead role in the response to WHO and partners.

7 November — WHO declares Sierra Leone to be Ebola-free.

29 December — WHO declares Guinea to be Ebola-free.

2016

14 January — A new case of Ebola is confirmed in Sierra Leone.

Annex III

Composition of the Panel

Jakaya Mrisho Kikwete (United Republic of Tanzania) (Chair) was elected as Fourth President of the United Republic of Tanzania in December 2005, and was re-elected for a second term in October 2010, completing his tenure on 5 November 2015. He was first appointed in 1988 to the Cabinet, where he held several ministerial portfolios, including Minister for Finance, Minister for Water, Energy and Mineral Resources and Minister for Foreign Affairs and International Cooperation (1995-2005). He served as the Chairperson of the African Union (2008-2009) and the Chairman of the Southern African Development Community Troika on Politics, Defence and Security (2012–2013). He is the current Chair of the Summit of East African Community Heads of State.

Micheline Calmy-Rey (Switzerland) assumed the office of President of the Geneva Cantonal Government (2001-2002) before being elected to the Swiss Federal Council in December 2002, heading the Federal Department of Foreign Affairs from 2003 to 2011. In 2007 and in 2011, she served two 1-year terms as President of the Swiss Confederation. In May 2012, she was nominated Visiting Professor at the University of Geneva.

Celso Amorim (Brazil) served as Minister of Foreign Relations (1993-1994 and 2003-2010), and as Minister of Defence (2011-2014). Prior to that, he served as the Permanent Representative of Brazil to the United Nations in Geneva (1991-1993) and the World Trade Organization (1999-2001), as the Permanent Representative of Brazil to the United Nations in New York (1995-1999) and as Ambassador to the United Kingdom (2002). He was also Chief Executive Officer of the Brazilian Film Corporation (Embrafilme) from 1979 to 1982 and served as Under-Secretary in the Ministry of Science and Technology (1985-1988). He is the author of several books and other publications on culture, science and technology policy and international relations. His latest book is entitled *Teerã, Ramalá e Doha* (2015).

R. M. Marty M. Natalegawa (Indonesia) served as Minister for Foreign Affairs of the Republic of Indonesia (2009-2014), prior to which he served as the Permanent Representative of Indonesia to the United Nations in New York (2007-2009). From 2005 to 2007, he served as the Ambassador of Indonesia to the United Kingdom. He began his career with the Department of Foreign Affairs of Indonesia in 1986.

Joy Phumaphi (Botswana) is the Executive Secretary of the African Leaders Malaria Alliance. She served as a Member of Parliament, holding portfolio responsibility in the cabinet, first for Lands and Housing (1995-1999) and then for Health (1999-2003). She later joined the World Health Organization as Assistant Director-General for Family and Community Health (2003-2007). She has served as Vice-President for Human Development at the World Bank (2007-2009). She has also served on a number of commissions and expert groups and sits on the Board of several international non-profit organizations working on global health.

Rajiv Shah (United States) served as Administrator of the United States Agency for International Development (2010-2015), advancing its mission of ending extreme poverty and promoting resilient, democratic societies. He pioneered new public-private partnerships and catalysed scientific innovation, enlisting the private sector and bipartisan Congressional leaders to join in the cause. He also led the

United States Government's humanitarian response to catastrophic crises around the world, including the Haiti earthquake, Typhoon Haiyan and the Ebola epidemic in West Africa.

Previously, Mr. Shah served as Under-Secretary and Chief Scientist in the United States Department of Agriculture. Prior to that, he spent eight years at the Bill and Melinda Gates Foundation, starting at its inception and leading efforts in global health, agriculture and financial services.

Annex IV

Meetings conducted

Meetings of the full Panel

4-8 May 2015
United Nations Headquarters
New York and Greentree, New York

13-17 July 2015
United Nations Office at Geneva and World Health Organization
Geneva

2-6 August 2015
Guinea, Sierra Leone and Liberia

14-18 September 2015
United Nations Headquarters
New York

16-20 November 2015
United Nations Office at Geneva
Geneva

14-18 December 2015
United Nations Headquarters
New York

Round tables

2 July 2015
Round table on WHO reforms
United Nations Headquarters
New York

7 July 2015
Round table on previous and other health crises
United Nations Headquarters
New York

10 August 2015
Round table with regional offices in West Africa
Dakar

4 September 2015
Round table on the social sciences and health crisis response
University of Sussex
Brighton, England

9 and 10 November 2015
Round table with experts on the preliminary findings of the Panel
United Nations Headquarters
New York

11 November 2015
Round table with experts on research and development
United Nations Headquarters and by teleconference
New York

Annex V

Research commissioned

Chatham House, "Profiles of successful responses to Ebola — Nigeria, Senegal and Mali", 3 August 2015.

Didier Wernli, MD, and Antoine Flahault, MD, "Strengthening research and development for and access to health technologies for neglected diseases and global health threats", 3 July 2015.

David Fidler, "Memorandum on the International Health Regulations", 9 July 2015.

Awa Coll-Seck, MD, "Ebola's impact on Senegal", 16 August 2015.

Chatham House, "Public health surveillance and alert in sub-Saharan Africa", 29 October 2015.

Alan Capps, PhD, "Military involvement in the Ebola response", August 2015.

Oyewale Tomori, DVM, PhD, "Nigeria's health infrastructure and its response to Ebola", Oyewale Tomori, DVM, PhD, 16 August 2015.

Chatham House, "Comparing Ebola experiences in Guinea, Liberia and Sierra Leone", 3 August 2015.

Chatham House, "Border issues in the West African Ebola outbreak: Regional dynamics", 3 August 2015.

Annex VI

Condensed bibliography

Abramowitz, S.A., Bardosh, K.L., et al. (2015, January 24). Social science intelligence in the global Ebola response. *The Lancet*, vol. 385, no. 9965, p. 330. http://dx.doi.org/10.1016/S0140-6736(15)60119-2

BBC News. (6 November 2015). Ebola: Mapping the outbreak. Retrieved on 20 November 2015 from http://www.bbc.com/news/world-africa-28755033

Baer, D. (2015, May 27). Bill Gates just described his biggest fear — and it could kill 33 million. *Business Insider UK*. Retrieved on 18 November 2015 from http://uk.businessinsider.com/bill-gates-biggest-fear-is-a-killer-flu-2015-5?r=US&IR=T

Baize, S. (2014, April 16). Emergence of Zaire Ebola Virus Disease in Guinea. *N Engl J Med*, 371, S. 1418-1425. DOI:10.1056/NEJMoa1404505

Bakari, E., Frumence, G. (2013, August 16). Challenges to the Implementation of the International Health Regulations (2005) on Preventing Infectious Diseases: experience from Julius Nyerere International Airport, Tanzania. *Global Health Action* 2013 6: 20942, http://dx.doi.org/10.3402/gha.v610.20942

Chandran, R. (2015, July 8). It's Not There, so Build It: Pandemic Response, the UN, and the World Bank. *United Nations University Centre for Policy Research*. Retrieved on 22 January 2016 from http://collections.unu.edu/view/UNU:3230

Chatham House. (2014). *Shared Responsibilities for Health: A Coherent Global Framework for Health Financing*. Retrieved on 26 November 2015 from https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20140521HealthFinancing.pdf

The Earth Institute, Columbia University. (2013). *One Million Community Health Workers: Technical Task Force Report*. Retrieved on 27 November 2015 from http://www.millenniumvillages.org/uploads/ReportPaper/1mCHW_TechnicalTaskForceReport.pdf

Commission on Creating a Global Health Risk Framework for the Future. (2016, January 13). *The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises*. Washington, D.C.: Institute of Medicine, National Academies of Science.

Dawood, F. S., Luliano, A. D., et al. (2012, September). Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study. *The Lancet, 12*(9), 687-695. Retrieved on 1 December 2015 from http://www.thelancet.com/journals/laninf/article/PIIS1473-3099(12)70121-4/abstract

DuBois, M., Wake, C., et al. (2015, October). *The Ebola response in West Africa: Exposing the politics and culture of international aid*. London, United Kingdom: Humanitarian Policy Group, Overseas Development Institute.

Durrheim, D. N., Crowcroft, N. S., & Strebel, P. M. (2014, December 5). Measles — The epidemiology of elimination. *Vaccine, 32*(51), 6880-6883. DOI:10.1016/j.vaccine.2014.10.061

Ebola Interim Assessment Panel. (2015, July 7). *Report of the Ebola Interim Assessment Panel.* Geneva: World Health Organization.

Farmer, P. (2015, July 10). *Building Health Systems and Increasing Resilience to Crises: Lessons from Rwanda.* Office of the Secretary-General's Special Adviser on Community Based Medicine and Lessons from Haiti.

Gates, B. (2015, March 18). The Next Epidemic — Lessons from Ebola. *N Engl J Med,* 372, p. 1381-1384, DOI: 10.1056/NEJMp1502918

Gostin, L.O, Friedman, E.A. (2015, May 9). A retrospective and prospective analysis of the west African Ebola virus disease epidemic: robust national health systems at the foundation and an empowered WHO at the apex. *The Lancet* 2015; 385: 1902-09.

Gostin, L.O., DeBartolo, M.C., et al. (2015, November 22). *The Lancet*, vol. 386, no. 10009, p. 2222-2226. http://dx.doi.org/10.1016/S0140-6736(15)00948-4

Håkon Angell Bolkan, D. A.-T. (2014, December 19). Ebola and indirect effects on health service function in Sierra Leone. *PLoS Curr.* DOI:10.1371/currents.outbreaks.0307d588df619f9c9447f8ead5b72b2d.

Ighobor, K. (2014, December). Ebola Threatens Economic Gains in Affected Countries. *African Renewal.* Retrieved on 20 November 2015 from http://www.un.org/africarenewal/magazine/december-2014/ebola-threatens-economic-gains-affected-countries

Independent Expert Group. (2015). *Policy Recommendations for the G7 from the Independent Expert Group (IEG): Preparing for the Next Epidemic — A Global Preparedness and Response System.*

Institute for Development Studies. (2015, February). *Practice Paper in Brief 16: Ebola and Lessons for Development.* Brighton, United Kingdom: Institute for Development Studies, University of Sussex.

Institute for Development Studies. (2015, February). *Practice Paper in Brief 24: Local Engagement in Ebola Outbreaks and Beyond in Sierra Leone.* Brighton, United Kingdom: Institute for Development Studies, University of Sussex.

Institute of Medicine. (2014). Summary. In G. J. Buckely, J. E. Lange, & E. A. Peterson (Hrsg.), *Investing in Global Health Systems: Sustaining Gains, Transforming Lives* (pp. 4). Washington, D.C.: National Academies Press. Retrieved in December 2015 from www.nap.edu/read/18940/chapter/1

Kamradt-Scott, A., Harman, S., et al. (2015, October). *Saving Lives: The Civil-Military Response to the 2014 Ebola outbreak in West Africa.* Sydney, Australia: The University of Sydney.

Katz, R., Fischer, J. (2010, Spring). The Revised International Health Regulations: A Framework for Global Pandemic Response. *Global Health Governance*, vol. 3, no. 2. Retrieved on 21 January 2015 from http://ghgj.org/Katz%20and%20Fischer_The%20Revised%20International%20Health%20Regulations.pdf

Keesing, F., Belden, L. K., et al. (2010, December 1). Impacts of biodiversity on the emergence and transmission of infectious diseases. *Nature, 468* (7324), 647-652. DOI:10.1038/nature09575

Klein, E. (2015, May 27). The most predictable disaster in the history of the human race. *Vox*. Retrieved on 22 January 2016 from http://www.vox.com/2015/5/27/8660249/gates-flu-pandemic

Louise H. Taylor, S. M. (2001, July 9). Risk factors for human disease emergence. *Philos Trans R Soc Lond B Biol Sci*. DOI:10.1098/rstb.2001.0888

Médecins Sans Frontières. (2015, March 23). *Pushed to the Limit and Beyond: A year into the largest ever Ebola outbreak*. Retrieved on 21 January 2016 from https://www.doctorswithoutborders.org/sites/usa/files/msf143061.pdf

Menéndez, C., Lucas, A., et al. (2015, January 22). Ebola crisis: the unequal impact on women and children's health. *The Lancet*. http://dx.doi.org/10.1016/S2214-109X(15)70009-4

Moon, S., Sridhar, D., et al. (2015, November 22). Will Ebola change the game? Ten essential reforms before the next pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola. *The Lancet*, 386: 2204-21. http://dx.doi.org/10.1016/S0140-6736(15)00946-0

Morrison, J. S. (2014, November 11). The Trajectory of Ebola and Our Response. In *Global Forecast 2015* (pp. 92-95). Washington, D.C: Center for Strategic and International Studies.

Petherick, A. (2015, February 10). Ebola in West Africa: learning the lessons. *The Lancet*. http://dx.doi.org/10.1016/S0140-6736(15)60075-7

Plotkin, S.A., Mahmoud, A.A.F., et al. (2015, July 23). Establishing a Global Vaccine-Development Fund. *N Engl J Med*, 373;4. DOI: 10.1056/NEJMp1506820

Riley, S., Fraser, C., et al. (2003, June 20). Transmission Dynamics of the Etiological Agent of SARS in Hong Kong: Impact of Public Health Interventions. *Science*, 300 (5627), 1961-1966. DOI:10.1126/science.1086478

Roos, R. (2012, June 18). Fouchier study reveals changes enabling airborne spread of H5N1. *CIDRAP News*. Retrieved on 18 November 2015 from http://www.cidrap.umn.edu/news-perspective/2012/06/fouchier-study-reveals-changes-enabling-airborne-spread-h5n1

Rubin, H. (2011, January 14). Future Global Shocks: Pandemics. *Multi-Disciplinary Issues*, OECD/IFP Project.

Sack, K. F. (2014, December 29). How Ebola Roared Back. Retrieved on 21 November 2015 from http://www.nytimes.com/2014/12/30/health/how-ebola-roared-back.html

Takahashi, S., Metcalf, C. J. E., et al. (2015, March 13). Reduced vaccination and the risk of measles and other childhood infections post-Ebola. *Science*, Vol. 347 (no. 6227), 1240-1242. DOI:10.1126/science.aaa3438

Save the Children. (2015). *A Wake-Up Call: Lessons from Ebola for the world's health systems*. London, United Kingdom: Save the Children.

Serdobova, I., Kieny, M. (2006, September). Assembling a Global Vaccine Development Pipeline for Infectious Diseases in the Developing World. *AJPubHealth*, Vol. 96, No. 9.

Shiu Hung, L. (2003, August). The SARS epidemic in Hong Kong: what lessons have we learned? *Journal of The Royal Society of Medicine, 96*(8), 374-378. Retrieved on 1 December 2015 from www.ncbi.nlm.nih.gov/pmc/articles/PMC539564/

Siedner, M.J., Gostin, L.O., et al. (2015, March 24). Strengthening the Detection of and Early Response to Public Health Emergencies: Lessons from the West African Ebola Epidemic. *PLoS Med* 12(3): e1001804. DOI:10.1371/journal.pmed.1001804

Sifferlin, A. (2014, December 17). 5 Million Kids Aren't in School Because of Ebola. Retrieved on 20 November 2015 from http://time.com/3637570/5-million-kids-arent-in-school-because-of-ebola/

Summers, A. (2014, December 19). Challenges in Responding to the Ebola Epidemic — Four Rural Counties, Liberia, August-November 2014. Atlanta, GA, USA: *CDC Morbidity and Mortality Weekly Report.* Retrieved on 21 January 2016 from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6350a5.htm

Sutherst, R. W. (2004, January). Global Change and Human Vulnerability to Vector-Borne Diseases. *Clinical Microbiology Reviews, 17*(1), 136-173. DOI:10.1128/CMR.17.1.136-173.2004

Taubenberger, J., & Morens, D. M. (2006, January). 1918 Influenza: the Mother of All Pandemics. *Emerging Infectious Diseases,* 12 (1). DOI:10.3201/eid1201.050979

Tully, C.M., Lambe, T., et al. (2015, January 14). Emergency Ebola response: a new approach to the rapid design and development of vaccines against emerging diseases. *Lancet Infect Dis* 2015; 15: 356-59. http://dx.doi.org/10.1016/S1473-3099(14)71071-0

United Nations Development Programme. (2014). *Socio-economic impact of the Ebola Virus Disease in Guinea, Liberia and Sierra Leone: Policy Notes Volume 1, Numbers 1-5.* United Nations Development Programme. Retrieved on 1 December 2015 from http://www.africa.undp.org/content/dam/rba/docs/Reports/UNDP Policy note EN_web.pdf

United Nations Economic Commission for Africa. (2015, January). *Socio-Economic Impacts of Ebola on Africa.* Addis Ababa, Ethiopia: Economic Commission for Africa.

United Nations General Assembly. (2014, September 19). GA Resolution 69/1: Measures to contain and combat the recent Ebola outbreak in West Africa. Retrieved on 21 January 2016 from http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/69/1

United Nations Security Council. (2014, September 18). *Resolution 2177 (2014).* Retrieved on 21 January 2016 from http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/2177%20(2014)

World Economic Forum. (2015, June). Managing the Risk and Impact of Future Epidemics: Options for Public-Private Cooperation. Retrieved on 21 January 2016 from http://www3.weforum.org/docs/WEF_Managing_Risk_Epidemics_report_2015.pdf

WHO. (2015). Factors that contributed to undetected spread of the Ebola virus and impeded rapid containment. Retrieved on 21 November 2015 from http://www.who.int/csr/disease/ebola/one-year-report/factors/en/

WHO. (2015). Implementation of the International Health Regulations (2005): Responding to health emergencies. Retrieved on 19 November 2015 from http://apps.who.int/gb/ebwha/pdf_files/EB136/B136_22-en.pdf

WHO. (2015). *World Health Statistics 2015.* Retrieved on 20 November 2015 from http://apps.who.int/iris/bitstream/10665/170250/1/9789240694439_eng.pdf?ua=1

World Bank. (2014). *Update on the Economic Impact of the 2014 Ebola Epidemic on Liberia, Sierra Leone, and Guinea.* World Bank Group. Retrieved on 1 December 2015 from http://www.worldbank.org/content/dam/Worldbank/document/Economic%20Impact%20Ebola%20Update%202%20Dec%202014.pdf

Yong Choi, J. (2015, September 1). An Outbreak of Middle East Respiratory Syndrome Coronavirus Infection in South Korea, 2015. *Yonsei Medical Journal, 56*(5), 1174-1176. DOI:10.3349/ymj.2015.56.5.1174

Annex VII

Acknowledgements

The Panel would like to express its deep appreciation to the Secretary-General, Ban Ki-Moon, for his leadership and commitment to preventing future health crises in the world. We thank the Secretary-General for entrusting us with this important task.

The Deputy Secretary-General, Jan Eliasson, and the former Chef de Cabinet for the Secretary-General, Ms. Susana Malcorra, have unfailingly supported us throughout the process and have our profound gratitude.

The wisdom and insights of Dr. David Nabarro, the former Special Envoy for Ebola, were particularly important throughout our work.

Our sincere thanks are due to Dr. Margaret Chan, the Director-General of the World Health Organization, for dedicating her time and for her willingness to engage in frank exchanges with the Panel. This acknowledgement also extends to her staff for their considerable support and cooperation.

Special recognition should be given to the Heads of State of the most-affected countries, with whom the Panel was privileged to meet: Alpha Conde, the President of Guinea; Ellen Johnson Sirleaf, the President of Liberia; and Ernest Bai Koroma, the President of Sierra Leone. The Panel salutes them for their tireless efforts in the fight against Ebola. In addition, thanks are due to John Dramani Mahama, the President of Ghana; Angela Merkel, the Chancellor of the Federal Republic of Germany; and Erna Solberg, the Prime Minister of Norway. The Panel is grateful to Germany and Norway for their particularly active role in financing the process.

Representatives of States Members of the United Nations and governmental authorities have shared much information related to the work of the Panel and have always been ready for consultations. We thank them for their engagement and contributions.

We are grateful to Dr. Nkosazana Dlamini-Zuma, the Chairperson of the African Union Commission; Dr. Jim Yong Kim, the President of the World Bank Group; Dr. Tom Frieden, the Director of the United States Centers for Disease Control and Preparedness; Dr. Joanne Liu, the International President of Médecins Sans Frontières, and all the United Nations agencies and partners that contributed to the deliberations. Moreover, a special thanks to the close to 300 experts that volunteered their time to share information and advice. This also included responders and survivors in the three most-affected countries.

At short notice, Ms. Gabrielle Fitzgerald, Dr. David Heymann, Dr. Ann Marie Kimball, Prof. Ilona Kickbusch and Dr. Lars Schaade made themselves available to arrange and expertly facilitate round tables in connection with the work of the Panel. We are extremely grateful for their energy and support.

Lastly, thanks are due to individuals who led the concurrent reviews that provided critical information and advice, including Dame Barbara Stocking and colleagues of the WHO Ebola Interim Assessment Panel; Dr. Victor Dzau and colleagues of the Institute of Medicine's Commission on Creating a Global Health Risk Framework for the Future; and Dr. Peter Piot and colleagues of the

Harvard/London School of Hygiene and Tropical Medicine Independent Panel on the Global Response to Ebola.

In a consultative process such as the Panel's work, it is natural that of the hundreds of people who very helpfully cooperated with us some important names will be omitted unintentionally. We are indebted to those experts, responders, officials, communities, Ebola survivors, and colleagues who at every instance gave of their time and advice unquestioningly. Their passion to see a world free of epidemics and pandemics inspired us.

We would like to acknowledge the work of our secretariat, including the secretariat director. Mr. Ramesh Rajasingham, Dr. Elin Gursky, Ms. Sanjana Quazi, Mr. Moritz Meier-Ewert, Ms. Sophie Rutenbar, and Ms. Karen Williams-Komlani. Further thanks should be extended to Mercator Fellow Mr. Jonathan Baum and interns Mr. Mobeen Bhatti, Mr. David Mangar and Ms. Kayla Robinson for their assistance with the process.